AN INTEGRATED SOCIO-DENTAL APPROACH

TO DENTAL TREATMENT NEED ESTIMATION

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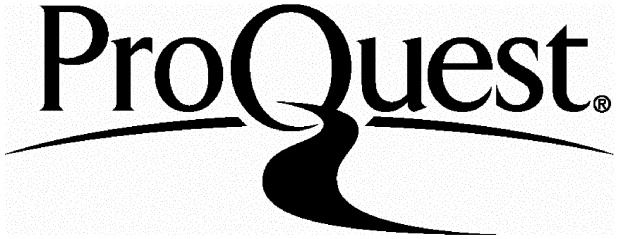

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ABSTRACT

To improve on the traditional approaches of dental treatment need estimation, a new theoretical model of treatment needs composed of 'Normative', 'Impact-Related', 'Effective' and 'Accessible' treatment needs, is proposed. The aim of the present study was to develop an appropriate socio-dental indicator to generate 'Impact-Related Treatment Need', compare them with traditional professionally assessed normative need, and to explore the preliminary approach to assess 'Effective Treatment Need' for periodontal treatment.

An oral health survey was carried out in Ban Phang district, Khon Kaen, Thailand. 501 people aged 35-44 years in 16 villages, selected by cluster random sampling process, were interviewed about oral impacts on daily performances and their oral health behaviours, and then were had clinical examinations.

A concise indicator 'Oral Impacts on Daily Performances' (OIDP) was developed, based on measuring impacts on eight physical, psychological and

social aspects of daily activities. Scores were calculated by multiplying the frequency by the severity scores of each performance, then scores were summated. The indicator was tested for psychometric properties on the study sample, using interviews and clinical examinations. Cronbach alpha of internal consistency was 0.65. Kappa of test-retest reliability ranged from 0.6 to 1.0. Criterion validity was shown by a strong relationship with general perceptions of oral impacts ($p<0.001$). Construct validity was demonstrated by significant differences of scores between groups with high and low prevalence of deep periodontal pockets, decayed and missing teeth, and number of functional teeth ($p<0.001$). The combination of specific OIDP scores and normative needs generated the impact-related need for various dental treatments.

As expected, the percentage of people with need was decreased from normative need, when Impact-Related Treatment Need was applied. The differences were large in needs for prostheses, orthodontics and periodontal treatment (ranging from 21.7% to 40.2% of normative need); moderate for restorations (64%); and low for pulp care, extractions and treatment for deep periodontal pockets (81.7%-91.7%). A similar pattern of need reduction was obtained when increasing cut-off points of OIDP scores.

An exploratory study to develop 'Effective Treatment Need' for periodontal treatment was done. It was shown, using logistic regression that plaque control and smoking were the behaviour-oriented risk factors which affected

behavioural propensity for periodontal destruction. Receiver Operating Curve showed the appropriate cut-off point of plaque level at 0.8. Behavioural propensity was determined from people who are non-smokers with plaque index of 0.8 or lower, to generate Effective Treatment Need. The results indicated that the majority of people who had Impact-Related Treatment Need for periodontal treatment did not have the acceptable level of behavioural propensity required for effectiveness of treatment. The advantages of the socio-dental needs approach in dental care planning were demonstrated and discussed.

It was concluded that the OIDP is a valid and reliable indicator of oral outcomes. Integrating it into Impact-Related Treatment Need, as well as further integration of behavioural propensity to generate Effective Treatment Need could provide alternative improved dental treatment need estimations.

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CHAPTER 1

BACKGROUND TO THE STUDY

The need to plan health services is rooted in the ethical imperative to use limited health resources appropriately. Generally, the public health planning system is based on the data related to health of the target population to estimate the type and extent of services. Over time, as health care provision has become more complex and expensive, the data related to health status and its changes has become more important for the planning and evaluation of health care provision (Scrivens et al, 1985; Hunt el al, 1986). Simultaneously, the changes in disease patterns, particularly the increasing significance of non-fatal chronic conditions which are the major health problems in developed nations, plus contemporary concerns with the quality of life, have led to broadening of the dimensions of health. This has made the problem of measuring health need more difficult.

The need for dental services has traditionally been assessed from oral health status based on professional judgement. Schonfeld (1981) suggested four steps to estimate dental manpower need as: assessment of dental health status of the population, translation of dental conditions into needs for services, estimation of the time required to provide the needed services, and conversion of required time into estimate of manpower needed. Although there are other

approaches to manpower and resource planning, such as using economic forecasting or manpower-to-population ratios or markets forces-base (Goodman and Weyant, 1990), the health status assessment approach is preferable from a public health viewpoint because it can be used to identify problems which exist and need attention. However, this direct conversion raises many questions about the suggested and actual pattern of dental care and the effects of providing treatment or unmet need.

Beck (1968) introduced the Dental Services Index, in an attempt to overcome these shortcomings. The index, using an extensive coding system based upon well-defined criteria, provides a directly proportional of the amount of dental treatment required to the dental disease findings. Hobdell et al (1975) expanded Beck's index into multiple stages in planning a dental programme from estimating size of problems, formulation of treatment strategies, conversion of treatments to relative value units, time required, costs and finally the dental personnel team.

The direct treatment planning approach, in which treatment need was based on direct examination of the individual, was introduced to solve the transformation uncertainties. Davies et al (1969) used a similar but simplified method which was tested (Davies et al, 1973), and subsequently accepted by the World Health Organization (1977). A similar pattern of development has occurred in the area of periodontal needs (McPhee, 1967; Bellini, 1974; Davies et al, 1974; Newcomb, 1975; Gjermo, 1976; WHO., 1978) and for other dental treatment needs. Simplified methods of surveying for oral health status and treatment needs developed by the World Health Organization (1977, 1987) were widely used by oral epidemiologists and dental public health

planners. In 1989, the manual "Health through oral health; Guidelines for planning and monitoring for oral health care" prepared by a joint working group of WHO/FDI, was published. It is being promoted as a manual for dental associations to aid in manpower planning. All the calculations are performed for 4 age cohorts: 14, 15-29, 30-64, and 65-79 year-old. For each cohort, estimates of services needed per person, expressed in minutes, are made for all aspects of oral health care over the whole period of each cohort. The identified care aspects are preventive care, special group care, surgical care, orthodontic care, and prosthetic care.

These kinds of professional approaches of treatment needs estimation obtained by using the condition-to-need or the professional screening approach were criticized for not considering either the outcomes of oral diseases, nor the consequence of limited resources for health care. It is also possible that most of these needs would not be perceived by people who would not seek the treatments proposed. The latter observation was confirmed by the discrepancy between the professional and the patient's definition of need in various studies (Giddon et al, 1976; Barenthin, 1977; Gelbier and Hope, 1979; Reisine and Bailit, 1980; Smith and Sheiham, 1980; Shaw, 1981; Anaise and Mann, 1982; Tervonen and Knuuttila, 1988; Razak and Ali, 1989; Gooch et al., 1989; Broughton and Smales, 1991). Cohen and Jago (1976) argued that clinical indicators of oral health would be greatly improved by adding a dimension of social impact. Then the indicators would encompass the broader implications of oral conditions that is more relevant to policy makers.

The shortcoming of professionally defined need for health care service lead to development of the broader measurement of health need. A variety of

sociomedical indicators have been developed and used in research and policy formulation over the past three decades (Andrews, 1981; Scrivens et al, 1985; Hunt et al, 1986; Mootz, 1986). They are multidisciplinary with major contributions from psychology, sociology, economics, operational research and biostatistics. In this period, dentistry has remained narrowly clinical in its conception and understanding of oral health (Locker, 1988). While a great deal of effort has been devoted to the construction of valid and reliable indices of oral disease, behavioural or subjective measures of oral health have rarely been used.

From the conception of the impact of oral conditions on daily life, Nikias (1979) proposed socio-dental indicators, defined as a measure of the extent to which oral conditions disrupt normal role functioning, and should be developed based on socio-medical theories. One of the advantages of using existing general health indicators is the ability to compare the results with impacts from other health problems. However, in consideration of sensitivity of measurement to detect the consequences of oral conditions, various specific socio-dental indicators have been developed and used by many researchers (Cushing et al. 1986; Locker and Grushka, 1987; Rosenberg et al., 1988; Gooch et al. 1989; Atchison and Dolan, 1990; Leake, 1990; Locker, 1992; Strauss and Hunt, 1993; Slade and Spencer, 1994; Rosenoer and Sheiham, 1995; Leao and Sheiham, 1995). The need for socio-dental indicators was echoed at the symposium on Self-Reported Assessment of Oral Health Outcomes (Kressin et al, 1996), as well as at conference on Assessing Oral Health Outcomes held in Chapel Hill in 1996 (Slade, 1996). The conference summarised and discussed oral health outcome measures in the fields of public health, aged care, clinical decision making, managed care and impact of

orthodontic therapy.

The need for socio-dental indicators in oral health planning was highlighted internationally by the Berlin Oral Health Declaration in 1992 (Mautsch and Sheiham, 1995). The declaration suggested that socio-dental indicators are more relevant measures of needs and should reflect pain, discomfort, function and aesthetics as well as clinical indicators of dental health.

While most socio-dental indicators are focused on impacts from oral disorders, Ettinger (1984) proposed that rational decision making in dental treatment, particularly in the elderly, should include an assessment of the functional and social benefits associated with alternative treatment plans. Maizels et al (1993) used a socio-dental approach to identify different dental treatment need groups.

Cochrane (1972) stated that the need for care is widespread while cure is rare, and that the pursuit of cure at all costs may restrict the supply of care. The point on the distribution at which therapy begins to do more good than harm should be established. Accordingly, in addition to measurement of oral health status and their perceived impact, behavioural factors affecting health gain from dental therapies should be included for needs estimation. These factors are the appropriate use of service and delays in seeking treatment (Locker, 1989), compliance with treatment instructions (Ingersoll et al., 1979), as well as inadequate self-care (Pitt Ford, 1986; Bates, 1986; Kieser, 1990; Shaw, 1991). Maizels et al (1993) pointed out that more realistic assessment of the dental treatment needs must include the individual's potential to benefit. This additional dimension or propensity to health and illness behaviour, could

provide a more behavioural and environmental consideration for treatment planning.

However, the practical use of socio-dental indicators in dental care planning has not been demonstrated. The research studies available on integration of psycho-social dimension into the development and evaluation of oral health services are limited. The further study on proper integration of dental impact on daily life and people's propensity in epidemiological survey, should provide information on the priority to be given to various treatment needs. That should lead to a more realistic and appropriate needs assessment for dental service planning.

CHAPTER 2

LITERATURE REVIEW

To construct a new system to estimate treatment needs for dental care requires more clarification and understanding of following issues:

- The concept of need in dental care,

- The socio-dental indicators,

- The propensity of people to adopt oral health care behaviours,

This chapter presents reviews of the above topics and some related considerations which has direct relevance to the formulation of theoretical background of the present study.

2.1 The concept of need in dental care

To define human nature in terms of needs is to define what we *are* in terms of what we *lack*, or a difference between what *is* and what *ought to be* (Ignatieff, 1984, Liss, 1986). Philosophy of need plays an important part in human societies. Marx developed the general philosophical concept of need, which stated that "the various shaping of material life is in every case dependent on the needs which are already developed, and the production, as well as the satisfaction, of these needs is a historical process" (Heller, 1974). In orthodox welfare economics, social need are demands which have been defined by society as sufficiently important to qualify for social recognition as goods or services which should be met by government intervention (Nevitt, 1977). While the right wing of politics argued that "One of the chief functions of the contemporary ideology of social justice may be to generate an illusion of moral agreement, where in fact there are profound divergencies of values". In other words, basic human needs are nothing but a dangerous and dogmatic metaphysical fantasy (Gray, 1983).

Perhaps the most challenging, and still unresolved, problem of needs research is how to define a need. The existence of an individual's needs cannot be proven in a direct physical way (Lederer, 1980). From an extensive debate in the international conferences of need implementation in Berlin (Lederer, 1980), the universal school of need approach was typified by the following definitions: "Needs can be understood abstractly to refer to those human requirements calling for response that makes human survival and development possible in a given society" (Masini); or "A need is an objective requirement to avoid a state of illness. Therefore, needs are objective and universal

because the states of illness are" (Gultang). The second school of thinking about need is strikingly typified by non universal definition, such as; "Needs will differ from society to society. This renders an a priori determination of needs impossible. Nor is it possible to talk of needs that are universally applicable" (Roy); or "Needs are constructed by the social structure and have no objective contents" (Rist).

The concept of need is often looked upon rather unfavourably by economists, in contrast with the concept of demand. Both, however, have their own strengths and weaknesses. Concepts of need are criticised as being too mechanical, as denying the autonomy and individuality of human person. While the idea of totally autonomous choice in the concept of demand implies first that the choosers know the alternatives which are open to them and second that they make the choices according to value criteria or a utility function. This is particularly so in the case of medical care from professional supplier. The concept of need arises because of certain deficiencies in demand as a principle of allocation. Demand, perhaps because of its great stress on autonomy and freedom, is libertarian rather than equalitarian, and liberty is seldom equally divided (Boulding, 1966). In dental services, studies have shown that the dentist, who is the supplier in dental services, can induce dental treatment utilization in order to achieve a target income (Birch, 1988; Grembowski et al, 1988; Grytten, 1991; Grytten, 1992). The assessment of need is considered as a mean of setting priorities equitably (Coast et al, 1996). Need assessment has a place in broad policy choices, and historically has supplied one basis for resource allocation in the National Health Service in the UK (Frankel and West, 1993). The Swiss Public Health Act lays down that the policies of the health care system should be determined only by the needs

of patients (Liss and Nordenfelt, 1990). However, the predominant existing types of national dental health services showed that, in reality, need is always used for targeting in combination with demand (Barmes, 1975).

In the context of health care, need concepts were also presented in various ways. According to Acheson (1978), there has been two different approaches to the definition of need for health care. Firstly, the "humanitarian" view which was described by Donabedian (1974) as "some disturbance in health and well being". Need is defined in terms of phenomena that require medical care services. It implies that when there is human suffering we must do something about it. But it fails to take into account the consequence of limited resources for health care. Second, the "realistic" approach of need, Matthew (1971) and Cochrane (1976) suggested that need should be recognised only when it can be met with some medical intervention that has positive utility and that actually alters the prognosis of the disease in some favourable way at reasonable cost.

There is no general agreement on what constitutes health need. Sometimes need is defined in term/s of treatment required. For example, Donabedian (1974) presents "a service equivalent of need" or "need for" concept which are procedures that may be deployed to meet that need. This approach is constrained by resource allocation. Cooper (1975) had a homologous definition; "a state of health assessed as in need of treatment by a medical practitioner". Whereas, Matthew (1971) extended this service-related definition to effectiveness of treatment as "a need for medical care exists when an individual has an illness or disability for which there is an effective and acceptable treatment or cure". Liss and Nordenfelt (1990) proposed the term

'the goal of need'. They discussed that, when we have a need, we do not only have a need *for* something, we also need this something in order to reach or obtain some goal. The goals of need will determine the quantity and quality of the care needed. To try to decide what we need could only be a form of speculation as long as we do not have a clear picture of the goal of need. Consequently, health need can be changed not only from giving care or cure, but also possible from changing the goal of need.

Nevertheless, the definition which has been generally used is the taxonomy suggested by Bradshaw (1972). "Normative need" is that which the expert or professional, administrator or social scientist defines as need in any given situation. "Felt" need is equated with "want", expressed as the individual's own assessment of his or her health care. "Expressed" need or "demand" is felt need turned into action by seeking assistance. "Comparative need" is obtained by comparing the health care received by different people with similar characteristics. "Unmet" need is the differences, if any, between those services judged necessary to deal appropriately with defined health problems and those services actually being received (Carr and Wolfe, 1979). Magi and Allander (1981) concluded that need is relative to time, place and assessor.

Assessment of need is used for priority setting, services and resources estimation, and evaluating health care system (Magi and Allander, 1981). The most commonly used need in dental health service planning is normative need. Because it seems to be relevant to the disease-oriented or bio-medical model, whose technique of observation was believed to identify diseases without depending on the subjective perception of the patient. In recent years, the shortcomings of this approach has been increasingly recognized.

First, professional judgements in normative need are not either value-free nor objective. Indeed, the whole concept of objectivity is much less clear cut than is often supposed (Teeling-Smith, 1973; Harman, 1974). Its methods often depend upon a consensus agreement from a number of subjective approaches. Even within those agreements, there was intra-examiner and inter-examiner variability among different judgements. There is no doubt from the evidence accumulated over a wide range of procedures and countries that doctors are doing very different things to comparable patients (McPherson et al, 1982). Elderton and Nuttal (1983) reported the range of the treatment costs planned by 15 dentists for 18 patients varied from £147 to £565. Similar studies showed the wide range of estimated costs for dental treatment (Hazelkorn, 1985; Shugars and Bader, 1992). The findings of large variability among dentists in decisions to restore teeth was supported by many studies (Rytömaa et al, 1979; Elderton and Nuttal, 1983; Merrett and Elderton, 1984; Kay et al, 1988; Bader and Shugars, 1993). Conrad et al (1984) concluded from a study of 346 dentists' treatment plans that there is substantial variations across dentists in any given patient, even after differences in clinical findings, patients' attitudes and financial conditions have been taken into account. Gordon (1991) criticized existing criteria for dental prostheses need measures that mostly are ambiguous and leaving border-line situations unresolved, and allow variability in decisions according to dentists' cultural, educational, and health care system background.

Second, the standard norm of measures of disease accepted by dentists, which are translated into treatment need is not always the norm in term of functional or social dimension of every persons examined. This problem occurred more often in conditions which lack easy definition such as occlusal disharmonies

(Sheiham et al, 1982). There is extensive evidence that people's dental satisfaction or perception of oral impact bear little relation to clinical assessment of oral condition (Giddon et al, 1976; Barenthin, 1977; Gelbier and Hope, 1979; Davis, 1980, Reisine et al, 1980; Smith and Sheiham, 1980; Cushing et al, 1986; Solomon et al, 1992; Tuominen and Tuominen; 1994; Elias, 1996). All the studies show that lay people tended to perceive less oral health problems than assessment by dentists. Therefore, to justify need based solely on professional norms might not solve people's oral functional and socio-psychological problems nor increase people's satisfaction.

Third, need justified only by professionals was questioned in terms of human or consumer rights. As Liss and Nordenfelt (1990) point out, it becomes necessary to take a stand on the question on whose values the need assessment should be based. Campbell (1977) considered that discrimination between people with the same level of needs cannot be morally justified. Decisions of priority in medicine must be discussed publicly and should not be the sole prerogative of any one professional group or any single agency of government. In addition, recent developments in consumerism and marketing have highlighted the important role of "patient satisfaction". It was counted as an outcome measure of health care which is not only important in term of consumer's rights or taxpayer's rights but much evidence also suggests that patient satisfaction makes a direct contribution to other outcomes of medical care (Fitzpatrick, 1990). Particularly, with the oral problems which have no serious consequences for individual's ability to live a normal life, people do not usually regard themselves as sick. So the basis for their relationship with the practitioner is not one of patient/healer, which naturally favours the status and authority of the practitioner, but client/consultant, which introduces a

degree of equality and mutual respect and co-operation into the relationship (Bloom and Wilson, 1972).

Last, normative need is criticized for its paradoxical approach. Although, it predicts need in the belief that all the sick should be helped, it fails to be achieved in the realistic situation of limited health care resources. As Acheson (1978) stated, "If some of the needy receive the very complete care, nothing may be left for others. We cannot be endlessly generous and continue to be fair". This is why Fuchs (1972), an economist, described this kind of need as "romantic" rather than "humanitarian" need. Glass (1976) even mentioned normative need as the useless concept in planning health services.

More useful concepts of need have been suggested by many authors (Donabedian, 1974; Campbell, 1977; Acheson, 1978; Cohen and Jago, 1979; Shaw et al., 1979; Reisine, 1981; Sheiham et al., 1982; Tugwell et al, 1984; Patrick and Bergner, 1990; Maizels et al., 1993). Their comments are not mutually exclusive. However, the key elements of suggested improvement were ;

a) The consideration of people's need should be given in relation to the utility of the procedures available to meet it and the resources that permit those procedures to be used. There has to be the probability that the use of the proposed service will lead to an acceptable outcome and resources are available to provide it. Therefore, both effectiveness and cost of health care has to be included in need consideration.

b) Measuring need should include the outcomes which underlie need. These

outcomes comprise risk of morbidity and impairment, pain and discomfort, disability and dysfunction, handicap, and mortality. Attempts to meet each kind of need should lead to an acceptable overall outcome.

c) Assessment of need should be supplemented by measures of the social and perception aspects of health from lay people and the public. Definition of need should be a joint responsibility of the health profession and the citizens.

d) More realistic assessment of needs should comprise the individual's potential or propensity for responding to health care. This aspect of need should provide the different strategies needed to be planned for different groups in the population according to their potential.

2.2 The socio-dental indicators

One of the starting points for the accelerating interest in health indicator development was an awareness that, especially in the developed world, the conventional data collected about mortality, life expectation, and morbidity were increasingly giving a misleading impression about health trends (Culyer, 1983). In 'Toward a Social Report', published by the US Department of Health, Education and Welfare (1969), it was stated that, "Despite the substantial increase in life expectancy in the 20th century, we do not know whether we are in better health. The rise in life expectancy has been accompanied by the emergence of chronic degenerative diseases". The report recommended social indicators of healthy life. Another starting point lay outside the topic of health itself. The increasing size and complexity of

modern health services, which motivated the increasing expenditure on health services. There has been a general increase of interest in developing a system of social accounts that would transcend the traditional economic measures of people's well-being (Patrick and Guttmacher, 1983; Culyer, 1983).

The rising expectations of the past century have led to a shift away from viewing health in terms of survival, through a phase of defining it in terms of freedom from disease, to an emphasis on individual's ability to perform his daily activities, and on positive themes of happiness, social and emotional well being, and quality of life. Measurements of health which used to rely solely on laboratory or diagnostic tests, may rely on indicators in which a person (the patient or a clinician) make a judgement that forms the indicator of health, which are often termed "subjective" measurement. It has to stressed that, this definition of "subjective" is different from the other usual way to indicate whether the variable is observable or not (McDowell and Newell, 1987). This field of research measurements has become known as "Health indicators" (Culyer, 1983). Elinson (1976) termed these new methods "sociomedical" indicators of health. In a global view, the term 'quality of life' was used as an outcome indicator, added to social, as well as health service programme development (Department of Health and Social Security, 1989).

The sociomedical indicators movement, which incorporated social aspects of health to the traditional measurement of health status, has its major interest in the social impact of ill-health (for example, Mechanic and Volkart, 1962; Harris, 1971; Bergner et al, 1976; Williams et al., 1976; Kaplan et al, 1976; Sackett et al., 1977; Ware et al., 1978; Hunt and McEwen, 1980; Meenan et al., 1980; Andrews, 1981; Hunt et al., 1981). Subjective measures add an

essential component to clinical measures for determining the broader health outcomes. These subjective health measurements may be grouped into three main categories; those that record general feeling of well-being, those that record symptoms of illness, and those that focus on the adequacy of functioning (Chen and Bryant, 1975).

The two major approaches in developing the indicators are generic and disease-specific approaches. Even though generic instruments ease the comparison among different illnesses, they were criticized for their inability to identify condition-specific aspects of a disease that are essential for the measurement of outcome (Hutchinson and Fowler, 1992). Analysis of the areas in life affected by longstanding illnesses, showed considerable variation in relation to the conditions (Bowling, 1996). Therefore, investigators have tended to supplement generic health status measures with specific disease items. They use generic measures to make comparisons with other conditions, to broaden their outcome indicators, and because of the slow development of disease-specific questionnaires (Bowling, 1995). Generic measures will always require supplementation with disease-specific measures to detect important clinical changes (Guyatt et al., 1986). McKenna (1993) points out that the use of disease-specific measures avoids asking irrelevant questions of respondents and maximizes the chances of detecting clinically significant changes, which is essential in clinical and policy-oriented research.

The socio-medical approach is logically believed to suit dental ill-health because oral diseases are largely social and behavioural in origin and are almost entirely preventable by social and behavioural means (Cushing et al., 1986). Nikias (1985) stated that measurement of consequences of oral

diseases is essential for a full scientific understanding of the scope of oral health problems, rational decision-making with regard to the allocation of health care resources and the evaluation of dental health services.

The current development of socio-dental indicators comes from both general and specific approaches. On the theoretical basis, Nikias et al (1979) suggested to the development on the basis of role theory. Reisine (1981) applied Parsons' sick role model to oral health conditions and concluded that disruption in normal social function could be used as a basis for the conceptualization of oral disease impact. The advantages of this approach, which is using existing sociomedical instruments, is that the psychometric properties of the scale are known and comparisons can be made between oral health impacts and general health problems. Locker (1988a) argued that role theory in general and sick role theory in particular, do not provide an adequate conceptual basis for the development of the necessarily broad range of measures of oral health. The broad measures of social roles are confined to relatively major changes in behaviour, such as inabilities to work or undertake household tasks. They would not incorporate the scope or changes consequent upon oral conditions. He suggested comprehensive set of concepts defined by Wood (1980) and Patrick (1982) which could be adapted to the WHO International Classification of Impairments, Disabilities and Handicaps (WHO, 1980).

This framework consists of disease, death, impairment, functional limitation, disability and handicap. The definitions of the different status' are:

Impairment is defined as anatomical loss, structural abnormality or

disturbance in physical or psychological processes, either present at birth or arising out of disease or injury, such as edentulousness, periodontium loss or malocclusion.

Functional limitation is restriction in function customarily expected of the body or its component organ or system, such as limitation of jaw mobility.

Discomfort extends biomedical measures to the subjective appraisals of well-being response to disease, such as self-reported pain and discomfort or other physical and psychological symptoms.

Disability is any limitation in or lack of ability to perform the activities of daily living. It includes not only ability restriction in mobility, body movement or self-care, but also other distinct dimensions of physical, psychological and social well-being. The Sickness Impact Profile (SIP) (Bergner and Bobbitt, 1981), for example, uses 136 items to measure the effect of disease on 12 major aspects of daily living.

Handicap is defined as the disadvantage experienced by impaired and disabled people because they do not or can not conform to the expectations of society or the social groups to which they belong. The disadvantage is multi-dimensional and can involve loss of opportunity, actual material and social deprivation, and dissatisfaction. Peter and Chinsky (1974) described the disadvantages from facial cleft that these people are more likely to remain single, marry later in life or have childless marriages. In one study, Smith and Sheiham (1979) have demonstrated the ways that oral conditions could handicap elderly people, such as one tenth of studied subjects felt

uncomfortable eating in front of others. Shaw et al (1980) showed that oral sources of handicap in school children caused by being teased about their dental appearances.

In practical terms, apart from mortality which is a rare outcome of dental disease, many oral outcome studies focus upon a number of single outcomes. Dental pain was the single major concern in some studies (Miller and Swallow, 1970; Miller et al, 1975; Lipton, 1985, Locker and Grushka, 1987; Jaafar et al, 1989). Satisfaction with appearance was also a key outcome in many studies relating to aesthetics and the social aspects in dentistry (Secord and Beckham, 1959; Linn, 1966; Schroeder, 1972; Helm et al, 1985; Soderfeldt et al, 1993). While functional outcomes have been measured mainly as chewing ability (Manly and Vinton, 1951; Kapur et al, 1964; Helkimo, 1977; Feldman et al, 1980, Wayer and Chauncey, 1983; Leake,1990; Van der Bilt et al, 1994).

Reisine et al (1989) applied the standard indicators to measure the impacts of dental conditions on patients' quality of life. Quality of life was conceptualized as a multidimensional construct including three major aspects: social functioning, measured by the Sickness Impact Profile (Bergner et al, 1976); well-being, measured by the Gill Well-Being Scale (Gill, 1984), Spielberger State/Trait Anxiety Scale (Spielberger et al, 1970) and the Corah Dental Anxiety Scale (Corah, 1969); and symptoms, measured by the Kiyak Oral Functioning Scale (Kiyak et al, 1984), the McGill Pain Questionnaire (Melzqack, 1975), and the West Haven Multidimensional Pain Inventory (Kern et al, 1985). The results in 152 patients reported numerous impacts on quality of life. The indicators used were sensitive to differences among

patients in TMJ, periodontal, denture and recall patients groups. Refinement of these measures was suggested for making them more adaptable for large community studies.

In the usages of specific indicators to detect the consequences of oral conditions, Cushing et al (1986) developed a socio-dental indicator by measuring the social and psychological impact of dental disease based on five categories of impact which were eating restrictions, communication restrictions, pain, discomfort and aesthetic dissatisfaction. Two total impact scores were derived by adding the number of categories for each individual, one including and one excluding discomfort. The results from 414 industrial workers showed that almost three-quarters had one or more impacts with various patterns of association to different clinical indicators.

Locker and Grushka (1987) conducted a survey of the prevalence of dental and facial pain and the impact on daily living in Toronto. Their questionnaire included the presence and severity of pain and its impact on seeking treatment behaviour, work loss, sleep disturbance, bed rest and worry. This study showed that almost 40 percent of study subjects had dento-facial pain during the past four weeks and worry was the most common impact.

Rosenberg et al. (1988) studied relationships between dental functional status, clinical dental measures and generic measures in 159 dental patients in New York. The 25-item dental functional status questionnaire was tested and used to determine the oral pain and discomfort, and the ability to chew, speak and interact with people without being self-conscious about self appearance. The study found that perceived general health is significantly correlated with age,

dental symptoms, and dental and medical functional status. The authors indicated that dental functional status does seem to be a separate component of dental health that might prove useful in defining treatment and evaluating quality and outcome of care.

Gooch et al. (1989) analysed three self-reported dental health questions that were asked of participants aged over 62 years in the Rand Health Insurance Experiment. The questions items were pain and distress, worry or concern, and reduced social interactions. The analysis indicated statistical appropriateness of the three-item scale. The results showed that self-reported impact was notably higher in the presence of a toothache, increasing number of decayed teeth, and worsening periodontal health.

Atchison and Dolan (1990) developed the "Geriatric Oral Health Assessment Index" (GOHAI) to measure oral health problems of elderly. The measure has 12 items derived from 36 items of different subjective impacts from oral problems; physical function, psychological function and pain and discomfort. A six point Likert scale, worded positively and negatively, was chosen for the scoring. All items were combined into one dimension. The index demonstrated acceptable reliability and validity. The testing results of GOHAI in 1,755 elderly sample revealed that the respondents with fewer teeth, wearing a removable denture, perceiving the need for dental treatment and lower socio-economic status showed a worse negative impact.

Locker (1992) studied the burden of oral disorders in a population of elderly by combining many previous indicators. He measured impairment by clinical measures; functional limitation by the index of chewing capacity (Leake,

1990); pain by a nine-item pain inventory (Locker and Grushka, 1987); oral symptoms and complaints other than pain by means of a 13-item inventory derived from Berkey et al. (1985); and disability and handicap by means of a seven-item scale of social and psychological impact of oral disorders derived from Smith and Sheiham (1979), one-item concerning worry and three-items of satisfaction with oral health. The results showed that, although only 24.1 percent were edentulous, a substantial proportion of elderly reported the impact of oral problems to their quality of life. Lower income groups had higher scores on psychological impact than higher income groups.

Strauss and Hunt (1993) developed "Dental Impact Profile" (DIP) to measure dental effects on life quality and social function. The 25 item measure assesses the impact of oral conditions in eating, health/ well-being, social relations and romance in 1,018 dentate and edentulous elderly. More than 50 percent of the respondents reported impacts from teeth. Eating factors were found to received the highest perception either by positive or negative impact.

The Oral Health Impact Profile (OHIP) was developed by Slade and Spencer (1994). The 49 scaled index of the social impact of oral disorders was derived from 535 statements by assessing 328 persons. The measure included six sub-scales of functional limitation, physical discomfort, psychological discomfort, physical disability, psychological disability, social disability and handicap, which derived from a model suggested by Locker (1988a). Scores were derived from Likert scale asking the frequency of impacts. Thurstone's method of paired comparisons was used to generate weights among statements within each dimension, judged by 328 people and university students in Adelaide. The consistency, reliability, and validity were examined with

satisfactory results in various group of people (Locker and Slade, 1994; Slade et al, 1996).

Rosenoer and Sheiham (1995) adapted the questionnaires used by Cushing et al (1986) to assess the relationship between individual satisfaction with teeth and mouth, and the number, position and condition of the natural teeth. The results from 196 employees in London showed a very poor association between reported satisfaction with teeth and the number of standing teeth and only small differences in satisfaction by the number of functional posterior occluding pairs.

Leao and Sheiham (1995, 1996) also selected and adapted questionnaires from Cushing et al (1986) and some other indices to develope a weighted socio-dental indicator. The 49 questions cover four main categories; dental appearance, mouth comfort, oral pain, eating restriction, and general oral performance. Extra questions were added for those who wore prosthesis. A weighting scale, based on the Nottingham Health Profile (Hunt et al, 1980), was developed to find a proportional relationship between the four dimensions. This questionnaire was validated and reliability tested in 622 people, aged 35-44 years, in Brazil.

From the socio-dental indicators mentioned above, which are rooted in different theoretical frameworks or different purposes, a definitive selection is difficult. In the context of developing framework, according to McDowell and Newell (1987), there are two ways of health index construction or how to choose some potential questions among virtually unlimited numbers of questions: from an empirical, or from theoretical standpoint. The empirical

approach is typically used when the measurement has a practical purpose, by testing a large number of questions with statistical procedures based on correlation method and choose those that predict the eventual outcomes. However, this approach faces the weakness that the user cannot necessarily interpret why those who answered a certain question in a certain manner tended to have better outcomes. The GOHAI and the DIDL, can be classified as examples of the socio-dental indicators developed by this approach. While the theoretical approach is to choose questions that are relevant from the standpoint of a specific theory of health. This approach enables the measure to be used analytically, rather than simply descriptively. The OHIP, for example, is the indicators developed from the modified theoretical framework of the WHO's International Classification of Impairments, Disabilities and Handicaps.

Health indicators are deliberately chosen to reflect problems of social concern and for which improvement is sought. Hence, a given indicator does not serve merely as a passive marker of health, but may come to be a rallying point for programs of social reform (McDowell and Newell, 1987). In the context of indicators' purpose, there are different implications for choosing and designing various health indicators. It is important to consider the relevant purpose of the measure for a particular study (Hall et al., 1984). As Moots (1986) suggested from the review of health indicators that, *"The selection of health indicators is always arbitrary and inevitably dependent on the research problems and available resources. Therefore, there is no point in trying to develop one single health index, since this disregards the various dimensions of the health concept within a given research problem"*. Thus, the application of socio-dental indicators for a specific purpose is important since the

properties of a measure may vary considerably according to its purpose and the context within which it is used (Patrick and Deyo, 1989). Measures for use in population surveys, for example, must be concerned about their efficiency, while measures for use in clinical trials may concern more about the sensitivity of clinical change.

2.3 Propensity of people to adopt dental health care behaviours

In the context of a multidimensional study of health, psychological and social factors are critically important. A biopsychosocial model of health (Engel, 1980) proposed that the diseases are not influenced by only the underlying pathology, but also by the individual's perceptions, personality and stress. Additionally, the characteristics of the social structure and the individual's social status directs how symptoms are expressed and acted upon.

Treatment planning in clinical dentistry is always better described as an art than as a science. Few criteria or systems have been developed for evaluation of the appropriateness of the overall treatment strategy. However, the consensus among the experts is that many factors are involved, including economic and psychological considerations (Kress, 1980). Apart from clinical determinants, socio-behavioural factors of the people has a strong effect on effectiveness of dental treatments. The failure to use obviously beneficial preventive services or the delay in seeking treatment for acute pain may be puzzling to the providers who believe in its effectiveness and desirability. Many providers judge patient behaviour in term of clinical significance of the problems that present or in terms of scientifically based estimates of the health

risks associated with certain types of lifestyle (Locker, 1989). At a community level, these psychosocial circumstances of the groups of people, have to be the key components for treatment need estimation as well. Maizels et al (1993) denoted that the individual's potential for increased dental health care should be included in a realistic assessment of dental treatment needs.

Many theoretical models have been developed to explain and/or to predict social behaviours related to health. Most of the models are based on the psychological and behavioural theory. Some major models in this group have been applied to dentistry, such as the Health Belief Model, the Health Action Model, the Theory of Reasoned Action and Social Learning Theory.

The Health Belief Model (Rosenstock, 1974, Becker, 1974) hypothesized that readiness to take action for health stems from a perceived threat of disease, coming from an individual's perception of his/her susceptibility to disease and its potential severity, and his/her belief that the psychological costs associated with taking the health action are outweighed by the benefits to be derived. However, this model has not proved useful in predicting children's dental health behaviour (Kegeles, 1963; Weisenberg et al, 1980; Kegeles and Lund, 1982, 1984). The Theory of Reasoned Action (Ajzen and Fishbein 1977, 1980; Ajzen, 1985) explained the relations among beliefs, attitudes, intentions, and behaviours. This model has been tested and successfully applied in many dental studies, such as; predicting sugar consumption (Freeman, 1984), tooth-brushing behaviour (Bateman, 1985), demand for dental care (Hoogstraten et al., 1985), dental attendance behaviour (Woolgrove, 1987; Hendricks, 1990).

However, some of the studies mentioned above are based on the assumption

that behaviour is performed by individual's internal determinants such as perception, belief, attitude or intention. Ajzan and Fishbein (1980) even stated that demographic characteristics, institutions, and policies have not necessary relation to any particular behaviours. Whereas Sheiham (1986) argued that the major determinants of health are the socio-economic and environmental conditions under which people live. Therefore, health behaviour should be analysed by including the background of those environmental forces.

Some models and theories have taken these dimensions into account, such as, the PRECEDE framework (Green et al., 1980) which is a model of health education planning. This model describes health behaviour as a function of the collective influence of three factors: predisposing factors (provide the rationale or motivation for the behaviour, eg. knowledge, attitude); enabling factors (allow a motivation to be realized, eg. resources, skills); and reinforcing factors (provide the continuing reward or punishment for a behaviour, eg. physical or social benefits). Knazan (1986) used elements of PRECEDE to design a programme to improve the oral health status of a group of elderly.

The role of environmental factors to compliment behavioural factors was supported by many studies. Cumming et al (1980), for example, analysed the 14 models that proposed to explain health actions. Most have variables relating to access to health care such as availability, costs and awareness of health facilities. The overall 99 variables in 14 models could be combined into six broad factors: accessibility to health care, evaluation of health care, perceptions of symptoms and threat of disease, social network characteristics, knowledge about disease, and demographic characteristics. Research on

compliance concentrated on six areas; patient knowledge, complexity of regimens, patient's health beliefs, doctor-patient relationship, ways of providing care and social supports (Sheiham, 1986). McKinlay (1972) identified six different groups of factors which have been included in studies of utilization and which are believed to be important in seeking dental and medical care. These are: socio-demographic, socio-psychological, socio-cultural, geographic and organizational factors. Anderson and Newman (1973) classified these factors into three types, predisposing factors which represents a person's propensity to use services, enabling factors which includes barriers to services, and thirdly perceived needs for health care. A review of six studies (Gift, 1984) showed similar conclusion that the groups of variables associated with the uses of dental services were demographic, economic, structural, personal and psychological background variables. Maizels et al (1991) developed an interactive model which considers both the clinical and the socio-psychological aspects of dental disease and its prevention. The model indicated that an individual's health status and treatment needs are influenced by three dimensions; 'vulnerability dimension', related to demographic and socio-economic background, dental history, and access to dental services ; 'motivational dimension' related to belief, attitudes, concern and expectations about dental health; 'preventive dimension', related to current dental practices, self-care and dental attendance.

Based on those theoretical grounds, it is reasonable to indicate that the potential or propensity of people to adopt dental health care comprises two broad groups of factors; 'behavioural' and 'environmental' factors. Behaviour and environment are not independent to each other. Indeed, it is well known that they have interactions. This classification is made in relevant to the

implication for the public health planning.

Behavioural factors

Health behaviour of the patient is also important in various dental treatments. In periodontal treatment, Kieser (1990) stated that, in all instances, whatever the degree of periodontal destruction, the effective control of the reasonably accessible plaque by the patient is paramount. Success of both non-surgical and surgical treatment methods has been shown to depend primarily upon the maintenance of a high level of supragingival plaque control by the patient. Thus, Kieser concluded that the demands made upon professional resources to compensate for the patient's ineffective efforts will preclude the implementation of professional plaque on a community basis. There is strong scientific evidence that plaque control is the essential factor in the recurrence of the periodontal disease following treatment (Bergstrom and Henrikson, 1974; Rosling et al 1976; Pilot, 1980; Preber and Bergstrom, 1990; Newman et al, 1994). Studies have also demonstrated that the outcome of various periodontal treatments is significantly compromised in smokers compared with non-smokers (Preber and Bergstrom, 1990; Jones, 1992; MacFarlane et al, 1992; Ah et al, 1994).

Longitudinal surveys have also demonstrated clearly in prosthodontic treatment that the patient's oral hygiene affects the life of partial dentures. If the oral hygiene remains poor and there are high plaque and periodontal index scores, then there is less hope of preserving the remaining teeth and doubts should be expressed as to whether partial denture treatment should be carried out (Bates, 1986). In a literature review concerning risk/benefit appraisal for orthodontic treatment, Shaw et al (1991) illustrated that where oral hygiene is

poor, orthodontic treatment increases predisposition to dental caries and gingival disease. The greatest risk in orthodontic treatment also comes from partial or total failure in accomplishing a worthwhile, lasting change, which may be caused partly by poor cooperation by the patient (Shaw et al, 1990).

Apart from various socio-psychological variables mentioned earlier, past behaviour was found to be a good predictor of health behaviour. Kegeles (1963), in a 3-year follow up study of dental visit behaviour, found that the best single predictor of behaviour is prior behaviour. Mullen (1987) showed that "past behaviour" is the most important predictor for changes in smoking, exercise, consumption of sweet and fried foods over a 8 month interval. The results from many retrospective studies which support the Health Belief Model imply that past behaviour predicts actual behaviour (Kegeles and Lund, 1984). Many compliance measures have shown similar results. Indices of compliance are frequently discrepant from actual behaviour (Gordis, 1979).

Environmental factors

The obvious influence of environmental factors on propensity to dental treatment is the effect on dental utilization. Numerous factors have been identified to be associated with the use of dental services. Among the common variables are age, sex, race, income, education, region of the country, rural/urban, availability of dental manpower, public knowledge about dental care procedure, and community social structures (see Gift, 1984). Elderly, male, low socio-economic status group have lower dental service utilization patterns. However, the recent finding indicate that the difference in dental visit habits according to gender are levelling out (Petersen and Holst, 1995). Apart from the common demographic characteristics, disadvantage groups are

described differently according to the place of studies. In the USA, for example, black and Hispanic minorities and people who lacked insurance had the low probabilities of using of dental services (Capilouto, 1991; Aday and Forthofer, 1992; Dolan and Atchison, 1993; Oral Health Coordinating Comittee, 1993; Hunt et al, 1995; Cherry-Pepper et al, 1995; Brown et al, 1995). In developing countries, such as Thailand, the disadvantaged groups of people for dental services are clearly identified as people who live in rural areas (Department of health, 1995; Petersen and Holst, 1995).

Accessibility of dental services seems to play an important role in utilization. Some studies indicate that improved access to dental services increases utilization (Henderson and Meneley, 1977; O'Mullane and Robinson, 1977). Other access issues, such as, cost of services or transportation have also been studied. Cost of service is reported as the second most common reason offered for not visiting the dentist in the USA (Brown et al, 1992). Three-quarters of elderly in rural area of Thailand reported the main reasons for choosing dental services relating to accessibility (Department of Health, 1995). The structural delivery system is one of the major determinants of accessibility and utilization. In Norway, which provides dental services with a fixed price schedule to which most dentists conform, there was no significant association between price and demand (Grytten, 1991). Chisick (1995) found that dental utilization rates of US military personnel, regardless of race and gender, greatly exceeded their employed civilian cohorts. The International Collaborative Study of oral health care systems (ICS, WHO, 1985) provides an evaluation of the impact of the multiple delivery system. The study showed the difference of utilization and reasons for utilization across systems. For example, unmet need was greater among children in predominantly private

practice with self-employment and direct payment systems. Motivational variables are less relevant in the system which is predominantly public practice with a limitation for an individual to choose when and where to receives services.

Propensity and treatment need

Todate, there are very few examples in literature demonstrating a practical linking of the potential of people, either in behavioural or environmental aspects to treatment need estimation. Bradshaw (1972) defined the term 'comparative need' to suggest a way to justify need by comparing the health care between different people with similar characteristics. Schwarz (1986) stressed the need to shift the emphasis from studies which describe people's behaviours to more action-oriented studies and programmes. Sheiham et al (1982) suggested that measures of propensity, when combined with lay perceptions of needs and measurements of clinical status, disability and handicap, should provide a more complete assessment of treatment needs and thereby improve treatment planning. Maizels et al (1993) explored the application of this concept by developing an indicator of people's potential, or propensity to adopt appropriate dental self-care measures. Thirteen motivational variables, which had been shown to be relevant to health-related decisions in 345 English workers, were regressed against a composite indicator covering five separate actions; regular attendance at a dentist, the frequency of cleaning teeth, sugar taken in tea or coffee, frequency of eating between meals, and amount of care taken in looking after teeth. Only five of the 13 motivational variables were significantly associated and explained 30% of variance in the composite indicator of preventive dental care. The propensity indicator was constructed by standardizing the scores for each of the dental beliefs, health beliefs,

satisfaction with present dental status, fear of dentist and satisfaction with the dental services. A cross-classification in low, medium and high categories of oral health status with the propensity indicator is used to define different treatment need groups.

This brief review of propensity indicate that a measure of propensity is an important component of need for dental care because its contribution to use of services and compliance with regimens for care.

2.4 Factors to consider in integrating socio-dental indicators and propensity of health/illness behaviours into treatment need estimates.

In clinical dentistry, dental educators agree that treatment planning is one of the weakest areas of the curriculum. Not enough research has been done to provide empirical bases for selecting among many treatment alternatives. When economic and psychological considerations are included, very few objective rules exist to guide what is generally classified as a matter of professional judgement (Kress, 1980). Planning for dental treatment need in populations faces the same situation. WHO's Oral Health Survey: Basic methods (1977,1987), which is widely used for dental public health planning, does not provide objective criteria for complicated treatments such as crown and bridge, prosthesis, or orthodontic treatment need. WHO accepted that treatment need criteria would have wide variations among examiners from different areas, caused by variations in the capacity of dental profession to meet demands for oral care and in professional attitudes and treatment

techniques.

When socio-dental indicators and propensity of behaviour are integrated to create broader dimensional treatment needs estimates, the criteria for judgement becomes even more complicated. Some of the considerations which have to be considered for providing basic guidelines of these integrations will be reviewed.

2.4.1 Considerations related to normative treatment need.

A number of factors need to be taken into consideration when assessing the relative importance of different types of normative need. They are outlined below.

a. Life-threatening and severely dysfunctioning conditions

In life-threatening oral conditions, treatment or further clinical and laboratory investigations are essential without assessing the impact on daily life or people's health/illness behaviour. Among oral health conditions, only oral cancer or precancerous lesions, fractures of jaw, and severe infection are life-threatening and are in this category (WHO, 1987). Dento-facial anomalies, such as cleft palate are also included.

b. Chronic progressive conditions

Some professional clinical judgements are based on the intention to prevent progression of irreversible impairments. *In these circumstances, impact of such impairments might be absent, but may arise in future. Thus, need*

considerations should not take the present impact dimensions into account. Nevertheless, progressive impairments should be reviewed carefully especially if there is a strong probability that unpreventable and irreversible progress toward a severe condition will occur and can cause negative impacts in spite of effective treatment.

Caries, for example, is a chronic destructive condition. Once there is a cavitation of enamel and bacteria have reached dentine, progress of the lesion is more rapid. With further progress of the lesion, the destructive processes overtakes the defence reactions. Concomitantly, the area of total loss of dentine will increase (Johnson and Coleman, 1986). However, in lesions progressing at a slow rate, arrested dentinal caries may result (Nikiforuk, 1985). Therefore, to avoid over-treatment, which has been considerable in many countries (Barmes, 1990), Elderton (1993) suggested that restorative treatment should be provided only for active dentinal caries together with proper preventive advice and care.

Current concepts of periodontal disease are not relevant to this consideration. Since the late 1970's, the dominant hypothesis is that periodontal disease progresses to severe destruction of bone in only a small proportion of the population. Progression is sometimes followed by a degree of repair, and mostly by prolonged periods of quiescence (Schaub, 1984; Pilot, 1990; Löe, 1993). There is no entirely satisfactory classification of periodontal disease and current understanding of the natural history of destructive periodontitis is poor (Johnson, 1990; Clark and Löe, 1993). Hence, any plan for treating all periodontal impairments is unreasonable as well as unrealistic.

c. The effectiveness of treatment.

Treatment which is professionally judged to be needed for a specific impairment, should be evaluated for its effectiveness. The need for health technology assessment arises from the concern that health technology may neither be used wisely, nor produce the expected health benefits (Tulloch et al, 1987). Many studies using the randomized controlled trial (RCT) have given ample warning of how dangerous it is to assume that well-established medical therapies which have not been tested are always effective (Cochrane, 1972). In dental therapies, there are few quantitative assessments of effectiveness. Tulloch et al (1987), for example, used the decision analysis method to evaluate the clinical management of mandibular third molars. Shaw et al (1991) evaluated the risk and benefit of orthodontic treatment by a review of related studies. Antczak-Bouckoms et al (1993) used meta-analysis on randomized controlled trials comparing surgical with non-surgical treatment for periodontal disease. These systematic reviews have been incorporated into "Evidence-based oral health care".

In assessing the outcome of treatment Antczak Bouckoms (1994) stressed that ultimate outcomes should determine the patient's utilities for the outcome as the treatment and the benefits affect many aspects of a person's life. Thus, socio-dental indicators also have a role in assessing ultimate outcomes of treatment effectiveness.

d. Perceived impacts without obvious normative needs

The discrepancy between professional and lay people's perception of treatment need has been reviewed earlier. Oral disorders, like many other chronic degenerative disorders, cannot easily identify a single causal factor, and

sometimes the pathology underlying particular symptoms is not obvious. Professional treatment has a limited role in this situation. The counselling or negotiating role between dental professional and client becomes more important in treating ill-health in such cases.

2.4.2 Considerations related to socio-dental indicators

Choosing an appropriate indicator for the study should consider many aspects of the index's qualifications. From a review of the major health status measurements, Ware et al (1981) identified five broad categories of their uses; measuring the efficiency or effectiveness of health interventions; assessing the quality of life; estimating the health needs of a population; improving clinical decision making; and understanding the causes and consequences of differences in health. The appropriateness of socio-dental indicators for each purpose may vary considerably. Thus, it is essential in selecting socio-dental indicators for this study, to the match purpose and qualifications of current established indicators.

There are at least three major qualifications of socio-dental indicators which should be considered for the measure at a population level in health care planning. First, the index should be brief and easy to use in large population within an appropriate time (Brazier et al., 1992). Second, it should be scaled according to units relevant to decision making criteria. Third, the index should measure variables specified by a system model to provide the cause-effect relationship information for policy makers (Bice, 1976). Therefore, a brief indicator with an appropriate scoring system which supports a relevant theoretical model is needed and is the basis for the measure to be developed

in this research.

An extensive review of existing subjective measures of oral health indicates that none conform to the criteria outlined above. Many have concentrated on understanding the causes and consequences of differences in oral health status (Rosenberg et al, 1988; Locker, 1992; Rosenoer and Sheiham, 1994). Some focus on a specific outcome. For example, the dental and facial pain prevalence and impacts measure (Locker and Grushka, 1987) or the index of chewing capacity (Leake, 1990). While the Geriatric Oral Health Assessment Index (Atchison and Dolan, 1990) is designed specifically for oral health problems of older people.

The Oral Health Impact Profile (OHIP, Slade and Spencer, 1994) and the Dental Impact on Daily Living (DIDL, Leao and Sheiham, 1996) come closest to the ideal. However, the OHIP, which permits the statistical scoring and has a sound theoretical basis, has disadvantages; it is long (49-item questionnaire) and uses a standard panel-weighting in different groups of population thus failing to consider possible cultural differences. The DIDL has a more flexible cultural relevant weighting system but the questionnaire is long and its theoretical basis is not as extensive as the OHIP.

The shortcomings of the available indicators lead to the consideration of developing the Oral Impact on Daily Performances (see Chapter 3, para 3.3).

2.4.3 Considerations related to propensity of health/illness behaviour

The factors related to health/illness behaviour can be classified roughly into

two major groups:

Behavioural factors, such as, past behaviour, individual's knowledge, attitudes, beliefs, values, perceptions and intentions.
Environmental factors, such as, demographic and economic factors, service accessibility and organizational factors.

Even though environmental factors have considerable influence on behavioural conditions, in the context of treatment need planning these two groups of factors have different implications. The group with low propensity due to behavioural factors could be considered as a low priority group for treatment need because they are unlikely to seek service or perform health related behaviours. That would reduce the effectiveness of some treatments. The need for such a low propensity group could predominantly focus on health promotion for behavioural change.

People whose unhealthy behaviour is due to poor environmental factors should be ethically regarded as the high priority group for treatment need. They should be considered as disadvantaged who require positive discrimination to improve their service accessibility as well as their educational, economic and social environments. The need to improve access to dental service, for example, might be targeted, together with need for treatment.

In the context of a propensity measurement, which is different from behavioural change prediction for health promotion strategy, the actual habit could be considered as the direct estimate of current propensity. There are several studies demonstrating that existing peoples' oral health habits, such

as tooth cleaning, sugar consumption, smoking or compliance are good predictors of future behaviour. Current behaviour are suggested to be one of the best available indicators for propensity of health behaviour (Kegeles, 1963; Gordis, 1979; Kegeles and Lund, 1984; Mullen, 1987). Past treatment seeking behaviour is more likely to be caused by accessibility of services.

However, propensity of oral health behaviour, are related to at least five domains; body cleaning and grooming (tooth cleaning), diet (sugar consumption), smoking, risk taking (accidents), attitude to professional (use of dental services). To date, apart from behavioural prediction or explanatory models, there is no practical approach to estimate propensity to maintain or change these behaviours.

2.5 AIMS OF THE STUDY

The main purpose of the present study is to develop the process of assessing dental treatment needs by integrating the perceived oral impact of lay people and propensity of people to adopt health care behaviour into normative need justified by clinical judgement and to analyse how this new theoretical treatment needs modify the conventional planning system of dental treatment in a group of Thai adults. In addition, this study also aims to develop an appropriate socio-dental indicator for the main purpose, and to investigate the factors affecting the integration of socio-dental indicators and behavioural propensity of people into the normative treatment need.

2.6 OBJECTIVES

2.6.1 To develop a socio-dental indicator to measure perceived oral impacts with the suitable qualification for the integrating process and to test its psychometric properties.

2.6.2 To collect data on oral health status, normative treatment need, the perceived impact of oral conditions, and the health and illness behaviour on a group of 35-44 year-old rural Thais.

2.6.3 To generate the dental treatment need which included perceived oral impacts from people with clinical judgements and compare this kind of treatment need, namely "Impact-Related Treatment Need", to the normative treatment need in the study population.

2.6.4 To explore the preliminary approach to assess the behavioural propensity of periodontal treatment and integrate it into the "Impact-Related Treatment Need" for periodontal treatment.

CHAPTER 3

THEORETICAL FRAMEWORK

3.1 Theoretical framework for assessing treatment needs

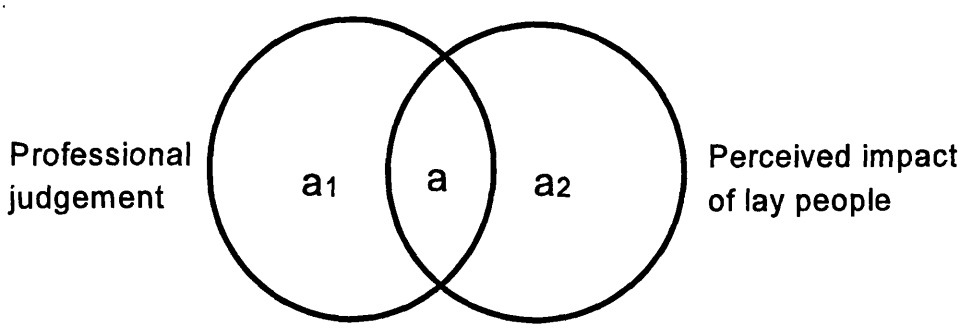
The proposed theoretical framework for assessing treatment need in this study focuses on the interaction between various dimensions in identifying dental treatment need. From the background of the study, an assumption is made that more appropriate dental treatment need should be considered not only from professional judgement, but also the related socio-dental impact and behavioural factors such as people's perception and propensity.

3.1.1 Interaction between "professional judgement" and "perceived impact" of lay people

Traditionally, only professional judgement is used for treatment need estimation. Figure 3.1a illustrates the interaction between perceived impact and normative treatment need. Area "a" represents the cases where professional diagnosed impairment and patient's perceived impact overlap. While area "a_1" represents cases which are identified by professionally examination as requiring treatment, the patients themselves do not perceive

impacts from their oral disorders. Area "a_2" is the perceived impacts of people, for which professional diagnosis does not provide a pathological basis or they are judged by professionals to be unsuitable to treat.

Figure 3.1a Interaction between professional judgement and perceived oral impacts of lay people

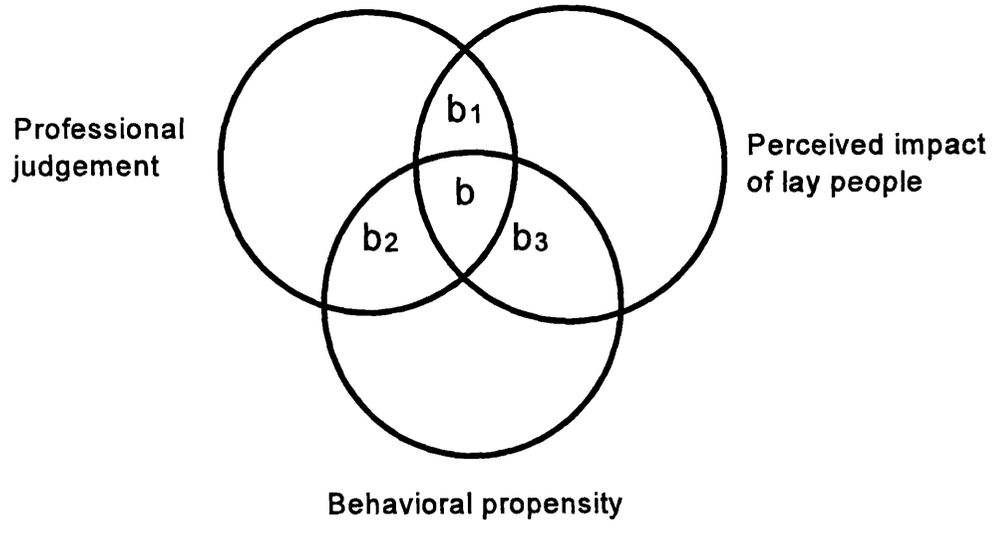


Apart from life-threatening and irreversible conditions with long-term effects, the combination of both professional judgement and lay people's perceived impact (area 'a') is more appropriate for dental treatment need estimations. This level of integrated need will be called *"Impact-Related Treatment Need"* in this study.

3.1.2 Interaction between "professional judgement", "perceived impact", and "behavioural propensity"

Here, behavioural factors relating to the people's propensity is taken into account. Area "b" in Figure 3.1b represents "Impact-Related Treatment Need" cases with substantial propensity to comply with preventive behaviours. Dental treatment provided to the cases professionally judged to need care plus perceived impact and appropriate propensity of behaviour, should have a more effective outcome. Therefore, the cases with this level of integration will be called *"Effective Treatment Need"*.

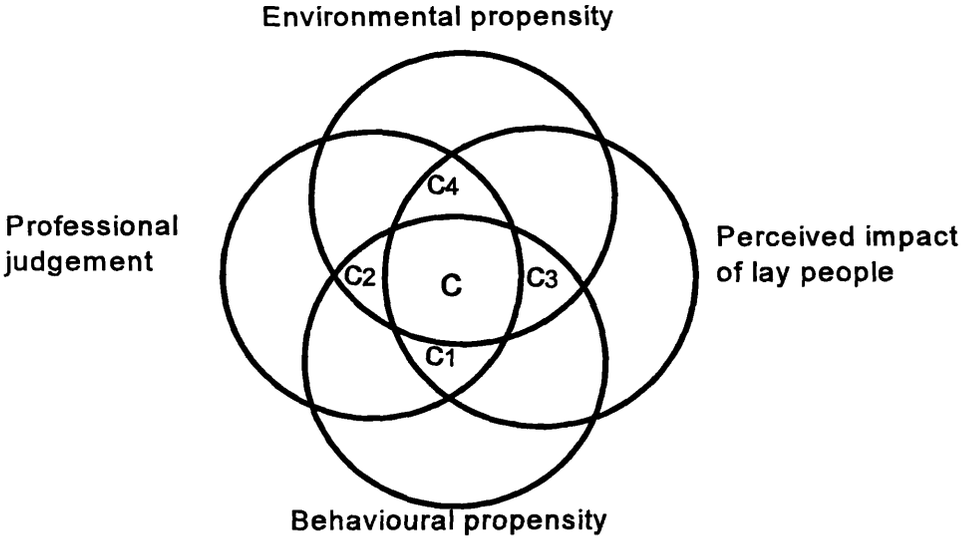
Figure 3.1b Interaction between professional judgement, perceived oral impacts, and behavioural propensity



3.1.3 Interaction between "professional judgement", "perceived impact", "behavioural and environmental propensities"

Environmental factors, such as demographic, economic and accessibility factors, play an important role in treatment seeking and treatment compliance behaviours. The group of people with these barriers was considered as having higher need for treatment. Figure 3.1c illustrates the inclusion of these factors with the previous three factors. Area "c" represents the cases of "Effective Treatment Need" with environmental barriers, which will be called *"Accessible Treatment Need"* in this study.

Figure 3.1c Interaction between professional judgement, perceived oral impacts, behavioural and environmental propensities



Area "c" is included in "Accessible Treatment Need" because of the disadvantages from environmental barriers, e.g. lack of treatment access or

economical problems. While areas "c_1" "c_2", "c_3" and "c_4" represent the groups with the combination of three from four considerable factors.

The interactions between these four factors have different characteristics for different kinds of dental treatment need. The need for replacing missing anterior teeth, for example, might have a bigger overlap between normative need, perceived impact of people and required behavioural factors than periodontal treatment need. The scheme for integrating these factors in treatment need estimation for the non-life threatening oral conditions, is shown in Figure 3.2.

3.1.4 Theoretical levels of treatment need

According to the variety of interactive conditions, dental treatment needs are classified into four levels in relation to factors for need estimation.

Normative Treatment Need

The planning system using normative treatment need level assumes that treatment need of people can be measured by professionals. Traditionally, this kind of need attempts to reflect overall oral impairments and has several shortcomings (see Chapter 2, para 2.1).

Impact-Related Treatment Need

This level of treatment need includes perceived impacts of oral problems on quality of people's lives. Combining people's perception should assist prioritizing the non-life threatening conditions and those with unclear norms or questionable long-term effects. They are difficult to assess by professionals

alone. Thus, treatment need is more selective, realistic and based on the perceptions of both professional and lay people.

Effective Treatment Need

Effective treatment need concerns, in addition to impact treatment need, the effectiveness of treatment due to person's behaviour. It takes into account the propensity of their health and illness behaviour. In impact related treatment need, people with low propensity (Area b_1 in Fig.3.1b) will only receive pain relieving and palliative treatment. This group is considered in need of health promotion to improve their propensity. Utilizing Effective Treatment Need will help the planner to provide more effective treatments and also to balance the amounts of resources between curative treatment and health promotion programmes.

Accessible Treatment Need

This considers all barriers to effective treatment of the people. In addition to the Effective Treatment Need, Accessible Treatment Need considers a higher priority of need in people with low propensity due to environmental factors, involving their disadvantages of socio-economic status and access to service. This environmental disadvantage group (Area c in Fig.3.1c) might highlight the need for broader improvements of the service system and reducing other barriers of service access. It also presents the high priority need of treatment in term of equality in health or "comparative need" (Bradshaw, 1972).

Table 3.1 Types of treatment need

Types of treatment need	Factors to consider	Expected service to be provided
Normative Need	Professional judgement	-Full treatment
Impact-Related Need	Professional judgement Perceived Impact	-Selective treatment based on impact
Effective Need	Professional judgement Perceived Impact Behavioural propensity	-Selective treatment based on impact and level of behavioural propensity *Health promotion
Accessible Need	Professional judgement Perceived Impact Behavioural and environmental propensities	-Selective treatment based on impact and propensities *Health promotion *Environmental and system change

* *intervention to improve propensity of people*

3.2.5 The decision tree model in dental treatment need assessment

Figure 3.2 shows how to integrate socio-behavioural factors, such as, people's perceived impact of oral conditions and people's propensity of health/illness behaviour, into the process of need estimation. The decision tree is rooted in the practical decision process in clinical practice where dentists have to balance their clinical judgement with patients' perception and propensity. The theoretical framework of the present study attempts to incorporate these factors into the dental public health planning in a similar manner.

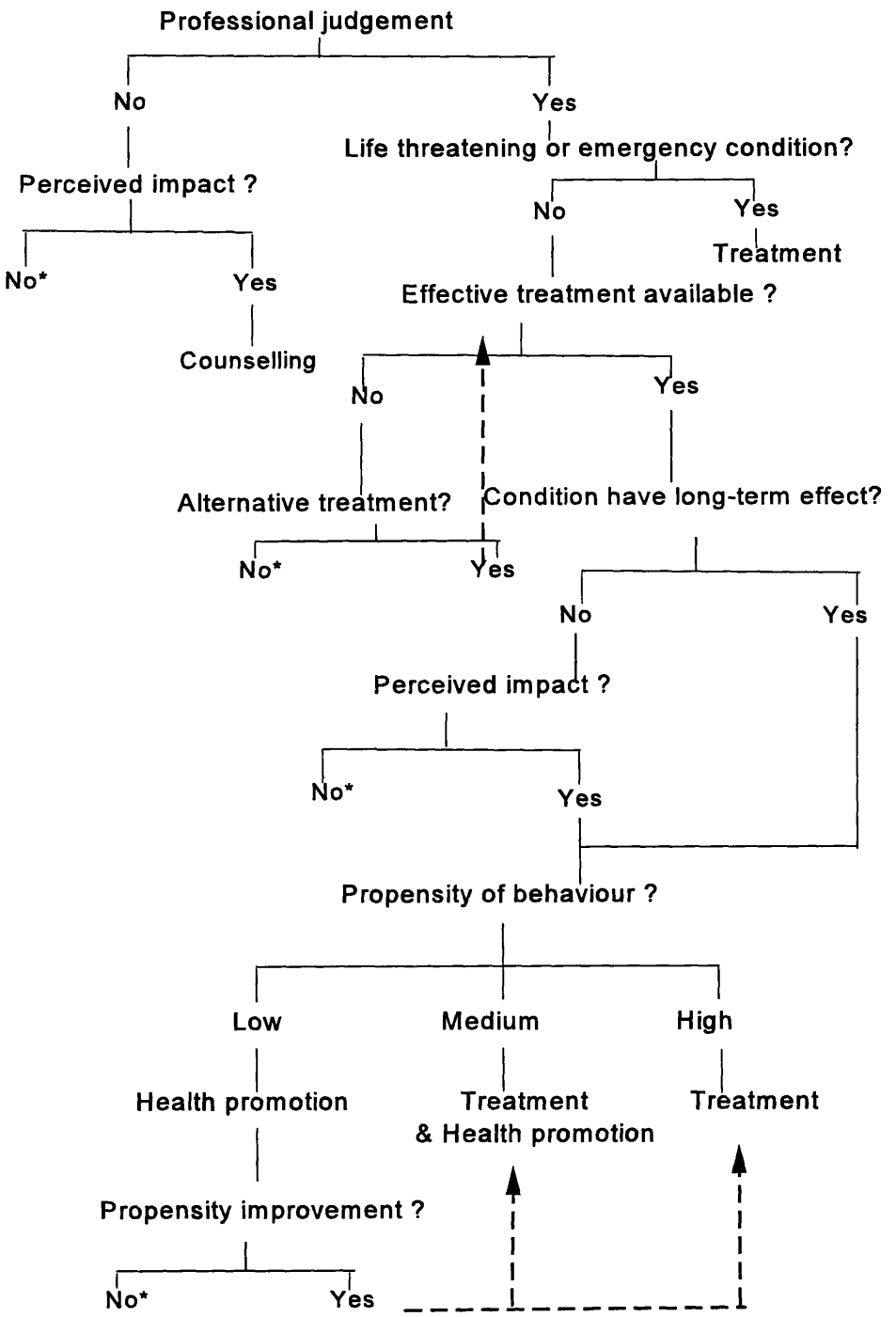
In the diagram, treatment need starts from professional diagnosis of dental treatment. According to normative treatment need, life threatening and conditions needing emergency treatment are considered to received the high priority for treating. Apart from that, the availability of effective treatment alternative has to be considered at the same time. Need for complicated pulp care, for example, might have to replaced by other alternative treatments, such as extraction, in an area with no endodontic treatment available.

When there are effective treatments available, the long-term effect of those needs have to be considered. The clearly chronic progressive conditions, such as active dental caries, should receive treatment even without perceived impact. However, in the case of unclear long term consequences, such as the mild or moderate maloccluded teeth, people's perception of impact from that condition should have a major role in justifying need.

Further consideration in the diagram concerns effectiveness of treatments due to patient's behavioural propensity which has an important role for health gain from treatment (see Chapter 2, para 2.4.3). The group of people who have low behavioural propensity are in need for "health promotion" to improve health behaviour for effective dental treatment.

In the group with no professionally assessed treatment need but having perceived impacts from oral conditions, counselling sessions might be needed to sort out the possible underlying problems.

Figure 3.2 Flow diagram showing a decision tree of 'Effective Treatment Need'



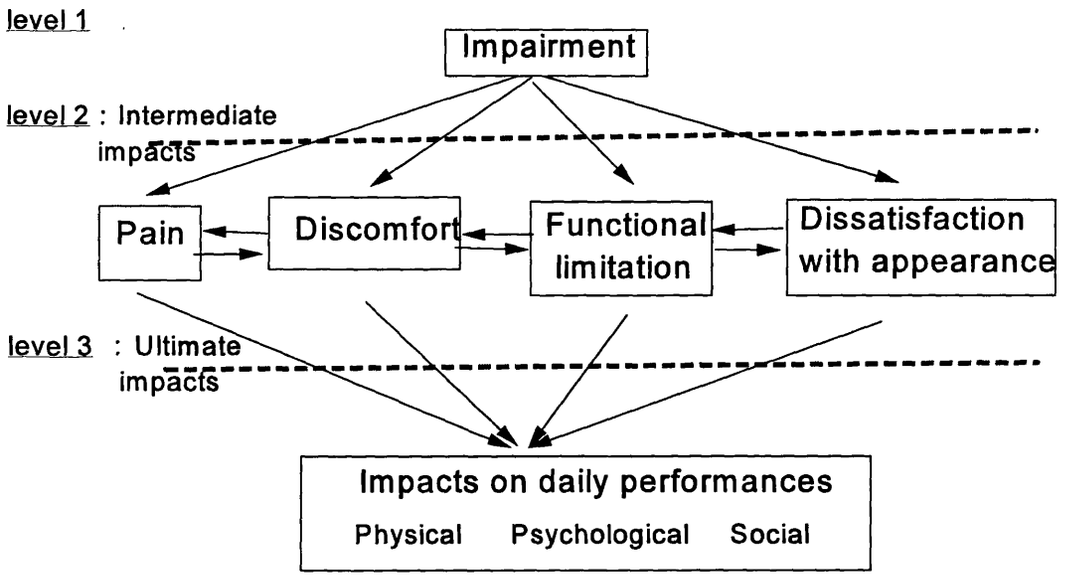
* No treatment provided

3.2 Theoretical framework in developing a new socio-dental indicator: The Oral Impacts on Daily Performances

As mentioned in para 2.4.2, there is a need for developing a new socio-dental indicator for this study. The new indicator should be concise with a appropriate scoring system and a relevant theoretical support. Figure 3.3 presents the theoretical framework on which the index of Oral Impacts on Daily Performances was based. This framework is modified from the WHO's International Classification of Impairments, Disabilities and Handicaps (Wood, 1980; Patrick, 1982), which was adopted and modified for dentistry by Locker (1988). The main modification is that different levels of consequence variables are established. The first level refers to the oral status including oral impairments which most clinical indices try to measure. The second level, "intermediate impacts", includes the possible earliest negative impacts caused by oral health status, which are pain, discomfort, or functional limitation. Dissatisfaction with appearance was added in this level since studies indicated that it was a major dimension of oral health outcomes (Linn, 1966: Linn, 1976; Helm et al, 1985; Cushing et al, 1986; Soderfeldt et al, 1992; Leao and Sheiham, 1996). In addition, functional limitation may cause pain, discomfort or dissatisfaction with appearance and vice versa. Any of the dimensions in the second level may lead to impact on performance ability. The third level, or "ultimate impacts" represents impacts on ability to perform daily activities which composes of physical, psychological and social performance. This level is equivalent to disability and handicap dimensions in WHO's model.

Figure 3.3 Theoretical model of consequences of oral impacts

(modified from the WHO's International Classification of Impairments, Disabilities and Handicaps)



The index of Oral Impacts of Daily Performances (OIDP) focuses on measuring Level Three consequences. That makes the measure concise and yet covers the main consequences. Other concise indicators concentrate on some of the intermediate impacts in Level Two such as, measuring pain, or chewing ability. OIDP, on the other hand, encompasses all of the consequences of the Level Two impacts in performing daily activities. Second, it helps to avoid, or at least reduce, overscoring from repeat scoring of the same impacts at each of the three levels. Third, only the significant impacts are recorded, by eliminating minor niggling conditions which do not lead to impacts on daily performances. By including very small and unimportant impacts, other indicators consider any deviation from the norm as a problem. For example, in general health, treatment is not recommended for minor complaint. If it was, virtually everybody would "need" care. By measuring ultimate impacts the screened outcomes should be more useful in

the context of policy planning as they reflect disability and handicaps. Lastly, it is less difficult to measure the behavioural impacts, in terms of performance, than the feeling-state dimension. The reliability and validity of behaviorally-based measures are easier to establish (Hall et al, 1984). Bergner et al (1976) also stressed that, to assess health status in the context of the population at large, it is better to rely on the behaviour of individuals than on their feelings.

3.2.1 Performances assessed

The nine physical, psychological and social performances were developed from the Comparison Table of Disability Indices (McDowell and Newell, 1987) and from various other socio-medical and socio-dental indicators, to achieve content validity (Smith and Sheiham, 1979; Bergner and Bobbitt, 1981; Hunt et al, 1986; Cushing et al, 1986; Martin et al, 1988; Atchison and Dolan, 1990; Strauss and Hunt, 1993; Slade and Spencer; 1994; Leao and Sheiham, 1996). They are :

a. Eating and enjoying food

b. Speaking and pronouncing clearly

c. Cleaning teeth

d. Doing light physical activities such as housework or walking

e. Sleeping and relaxing

f. Smiling, laughing and showing teeth without embarrassment

g. Maintain usual emotional state without being irritable

h. Carry out major work or social role

i. Enjoying contact with people

3.2.2 The scoring system

It was considered very important to introduce a scoring system for the OIDP which would generate objective units for decision making. Health indicators use a number of ways to quantify the impact; frequency, severity, number of items that each subject experienced or a combination of those approaches. Weighting between different dimensions of impact recognise the fact that items have different effects. The Oral Impacts on Daily Performances system attempts to use the logical approach of impact quantification by using both frequency and severity. A complementary objective is that the severity score weights the relative importance of respondents' perceived impacts within different performances.

From the statistical point of view, both frequency and severity need to have a ratio scale to multiply them. A five point scale was selected since there is little to be gained by using scales comprising more than five points (Cox, 1957; Lissitz and Green, 1975).

Frequency score

The common approach for frequency scaling is to rank order the responses from "very frequently" to "rarely or never" and then to assign a numerical score to each response category. The validity of this practice has been criticized. A critical review pointed out that people use the same adjectives in different ways. It cannot be assumed that "frequently" implies the same thing to different people, nor that it implies the same frequency when referring to common compared to rare health problems (Bradburn and Miles, 1979). Therefore, it was decided to express frequency in a more numerical way but also to consider the limitation of people's memory.

The criteria used for the estimated description in terms of both frequency and a spell period, was modified from the questionnaire of the National Survey of Health and Development (Medical Research Council, 1989) (Table 3.2). The respondent was asked to describe the frequency of impact by the pattern of occurrence.

Table 3.2 Criteria of frequency score of oral impacts

Category	Score
Never	0
Less than once a month and a spell up to 5 days in total	1
Once or twice a month, a spell up to 15 days in total	2
Once or twice a week, a spell up to 30 days in total	3
3-4 times a week, a spell up to 3 months in total	4
Every or nearly every day, a spell over 3 months in total	5

The time period over which to ask subjects to base their assessment of health outcomes is also problematic. Generally, it will be dependent on the aims of the study, the nature of outcomes, and balancing these against problems of recall bias. In chronic conditions it is necessary to consider longer time periods than for acute or non-chronic conditions. The time frame for the OIDP was set at the past 6 months period as that was often been used in chronic pain studies and considered to be appropriate for the commonly occurring oral conditions.

Severity score

From a review of the power law validating studies, McDowell and Newell

(1987) concluded that people can make subjective judgements in a remarkably internally consistent manner using a ratio, rather than an ordinal scale. People can judge, in a consistent manner, how many times stronger one stimulus is than another. Accordingly, the perceived severity of impacts in the OIDP was derived by asking respondents to justify the score, ranging from 0 to 5, as an indication of how much trouble it caused to their daily living. 5 represents "extreme" and 0 represents "none". The severity score provided the other dimension of impact, in addition to the frequency. Moreover, it gives weight to the relative perceived importance of the impacts. This approach should make valid the summation of each performance score to a total and to the final score.

Scoring method

The score representing the total impact on each performance was calculated by multiplying the frequency with the severity score. The total score was the sum of all the performance scores for an individual. Then the sum was divided by the maximum possible score (9 performances X 5 frequency score X 5 severity score = 225) and multiplying by 100 to give a percentage score; the OIDP for the individual.

3.3.3 Causal relationship of impacts

The aim of assessing causal routes was to provide information for relating the causes and consequences of differences in dental impacts on health. To increase the usefulness of the OIDP for assessing specific treatment needs, questions were asked about the perceived causal symptoms and impairments of any impact on performance. Respondents who perceived any impact were asked whether the major cause of their problems was from pain, discomfort,

limitation in function, dissatisfaction with appearance or other problems. Then they were asked to specify the oral impairments, such as toothache, loose tooth, gum abscess or bad breath, which they perceived caused their problems. Lay people's terminology of oral conditions differs from clinicians'. Toothache might include oral conditions from either dental caries, periodontal disease or others, which they were not capable of differentiating. Descriptive or normal analytical statistics were applied without scoring .

CHAPTER 4

METHODS

The study was performed as an investigation of treatment need in a group of Thai adults living in one district. The data on socio-dental and behavioural factors were collected, in addition to the basic information used in conventional dental public health planning. Various types of data were then analysed and integrated according to the proposed theoretical framework. The new modified treatment need estimation system will be compared to the conventional system, in terms of the extent of needs, as well as practicality for dental care planning.

The results of this study should not be extrapolated to be representative for the general population. The study objective is to develop a treatment need system using data from a representative population.

4.1 Sample

The sample was drawn from Ban Phang district in Khon Kaen province, Thailand by the following process:

4.1.1 *Age group*

The subjects were 35-44 year-olds. Age is an important factor for studying

determinants of oral health status, oral health behaviour and perceived impact of oral problems. Adults were used for the study population because, in the context of socio-dental and behavioural measures, they could provide direct information. They are also supposed to responsible for their own health care, such as seeking dental service, unlike children or older people who are generally more dependent. The 35-44 year-old group was chosen because it is the standard monitoring group for oral health condition of adults (WHO., 1987).

4.1.2 Sampling method and sample size

This study intends to apply the new approach of dental treatment need estimates within the basic oral health survey method, usually implemented worldwide. The cluster random sampling method with quota sampling approach recommended by WHO (1987) for oral health planning, is the most suitable method and was selected for the present study. The Ministry of Public Health of Thailand also recommended the same approach in the Manual of Oral Health Survey for Local Planning (1987), which has been widely used in oral health surveys at district level in Thailand. From this guideline, sampling sites are usually chosen so as to provide results for population groups likely to have different disease rates. Between 10 to 15 sampling points are usually sufficient for countries with small to moderate populations. A total of 20-25 subjects is sufficient in populations where oral disease levels are estimated to be low or very low. Therefore, basically, the sample size of 200-325 would be acceptable for the survey.

The above guideline was applied as a minimum level for cluster random sampling in the study area. Ban Phang district is a rural district in the area

with very low oral disease levels. The estimated mean DMFT in 12 years population in North-Eastern Region of Thailand, where Ban Phang situated, was 1.3 (SE 0.06) and in 35-44 years was 4.5 (SE 0.26), which is very low prevalence with a small variability. 11.2 per cent of 35-44 years people had deep periodontal pockets (≥6 mm) (Department of Health, 1995). There is no significant difference in socio-economic status or lifestyle across the whole district.

Four of the seven subdistricts were selected according to geographical criteria (see Appendix 4). Two villages from each sample subdistrict was randomly sampled. 28 to 35 subjects per study village were randomly selected. Additional sampling villages were drawn if there were not enough subjects per analytical cell. Finally, 524 subjects from 16 villages were selected. However, only 501 subjects (95.6%) had both interviews and oral examinations. The main reason why subjects were not available for oral examination was work constraints.

4.2 Information collected

Five main categories of data were collected (see Appendix 1-3);

4.2.1 Demographic data.

The demographic information was obtained from each sample based on the date of examination time-frame (January - May, 1995). The study and control variables were :

a. Age

b. Gender

c. Geographic location

d. Occupation

e. Education level

f. Marital status

4.2.2 Oral health status and treatment need.

A standard WHO oral health assessment form (WHO, 1987) and the oral examination form from the International Collaborative Study of Oral Health Outcomes (ICS II, WHO, 1989) were modified to collect the following data:

a. Dentition status and treatment need of teeth

b. Community Periodontal Index of Treatment Need (CPITN)

c. Sextants with bleeding gingiva and calculus (independently from CPITN)

d. Plaque level.

e. Oral mucosa and bone lesions

f. Malocclusion and orthodontics treatment need

g. Opacities and other enamel disorders and treatment need

h. Denture wearing and need for dentures

i. Bridge status and need for bridge

j. Temporo-mandibular joint assessment

k. Need for immediate care

4.2.3 General health perception and role functional status

The questions extracted from the SF-36 health survey questionnaire (Jenkinson et al, 1993) was asked about respondent's general health perception and functional status in the following dimensions:

a. General health perception

b. Role limitations due to physical problems

c. Role limitations due to emotional problems

d. Social functioning

4.2.4 Socio-dental data

The Oral Impact on Daily Performance (see Chapter 6) was developed to assess the perceived impacts of oral conditions by asking about oral impacts affecting the following performances:

a. Eating and food enjoyment
b. Speaking and pronouncing clearly
c. Cleaning mouth eg. tooth brushing
d. Other light physical activities
e. Sleeping and relaxing
f. Smiling, laughing and showing teeth without embarrassment
g. Maintain usual emotional state without being irritable
h. Carry out major work or role
g. Contact with people

The frequency and severity of the impact was assessed to calculate the total impact score. The perceived causes of the impact due to pain, discomfort, functional limitation, appearance dissatisfaction and related oral impairment was recorded.

4.2.5 Behavioural data

The questionnaire for interviewing was used to collect the following behavioural data:

a. Current tooth brushing behaviour
b. Current sugar consumption behaviour
c. Current smoking behaviour
d. Past dental service utilization

e. Treatment compliance behaviour

f. Socio-psychological variables related to seeking treatment;

- Perceived susceptibility to oral diseases
- Perceived benefits of dental treatment
- Perceived barrier to dental treatment
- Future intention for treatment seeking

4.3 Study implementation

The leaders and local health authorities of study areas were contacted to gain their permission and co-operation. The sample was selected for investigation mainly through health authorities and village health volunteers.

A pilot study was carried out in a few villages to test validity and appropriateness of the questionnaire. The main study took place after adaptating the study measures. All subjects were examined by one examiner and interviewed by one interviewer. Intra-examiner reliability were controlled by the re-examination and re-interview of 10 percent of the sample.

4.4 Data processing and analysis

The data collected was checked for accuracy and recording errors. Data was entered and analysed using SPSS/PC+ version 6.0.

Level of analysis

Descriptive level

There were two purposes for this level of analysis. The first was to describe the sample distribution, demographic characteristics, oral health status, perceived impacts of oral problems, health and illness behaviour. The second

was to describe and compare different types of treatment need according to the theoretical framework. Much of the data presented are in the form of straightforward number and percentages.

Analytical level

The purpose of this level of analysis was to test the psychometric properties of the OIDP and to examine its relationship with clinical oral conditions and selected demographic characteristics. Bivariate and multivariate statistical analysis were applied to obtain statistical associations where it was applicable.

Details of analytical procedures in specific sections were as follows;

4.4.1 Testing psychometric properties of the Oral Impacts on Daily Performances

Reliability

Test-retest reliability of the questionnaire was done by repeating interviews on 28 subjects, three weeks after the first interview. Kappa statistics of response agreement and reliability coefficient were calculated. Homogeneity of items was tested through item-total score correlation analysis. Cronbach's coefficient alpha (Cronbach, 1951) was used to indicate internal consistency reliability or homogeneity of items within the questionnaire.

Validity

Four types of validity were tested; face, content, criterion and construct validity (Anastasi, 1982).

Face validity, is not validity in a technical sense; it refers to whether the scale

appears superficially to "look valid" in the view of examinees or administrative personnel. Face validity of the OIDP was tested in a pilot study with regard to content, wording, scoring method and ease and appropriateness of administration. Content validity, or content coverage was studied through a literature review of various socio-medical and socio-dental indicators and then the pilot study.

Criterion validity, which involves assessing an instrument against an absolute standard, is seldom available for quality of life instruments since they measure phenomena which are experiential and subjective (Cox et al, 1992). Criterion validity of this study was tested by the relationship between the indicator scores and the general perception of oral impacts, as suggested by Locker and Miller (1994).

The *construct validity* of a scale is the extent to which the scale can be said to measure a theoretical construct or trait. In the present study, *the extreme groups* method was applied by comparison of the OIDP scores between two groups; one with a relatively healthy oral status and the other with obviously unhealthy status. It was hypothesised that those with poorer oral status in terms of number of sound, decayed, and missing teeth, and number of deep periodontal pockets, would report more impacts, or have higher scores.

4.4.2 Assessing 'Impacted- Related Treatment Need'

Impact-Related Treatment Need, as previously stated in Chapter 3, is the need ~~which~~ derived from a combination of professional judgement and lay people's perceived impacts of oral problems on the quality of their lives. In terms of data analysis, the combining included two main procedures;

A) Identifying the specific perceived impacts based on OIDP measures, which possibly are the cause of specific normative treatment needs.

The general OIDP score, which measures all oral impacts on subject's daily living, is too broad to assess the impact from one particular oral impairment which needs a specific treatment. OIDP scores caused mainly by toothache, for example, would not indicate lack of denture or need for one. Therefore, only oral impairments with some causal oral conditions were used to identify a specific treatment need.

The criteria for selecting specific causal impairments for a specific treatment need in the present study is shown in Table 4.1.

Because lay people often could not be very specific about which impairment was related to their impacts, relating the perceived impairment to specific treatment is imprecise. However, this approach should significantly eliminate perceived impacts from some oral conditions which are definitely not related to treatment need when integrating perceived impacts with normative need.

Table 4.1 Possibly related perceived impairments to identify Impact-related treatment need

Treatment	Possible related perceived impairments
Extraction	- toothache, loose tooth, position of teeth, tooth decayed - bad breath - gum abscess
Pulp care	- toothache, tooth decayed - bad breath - gum abscess
Filling	- toothache, colour of teeth, tooth decayed - bad breath - defective filling
Root planing /Periodontal surgery	- loose tooth - bad breath - bleeding gum, gum abscess, receding gum - calculus
Scaling	- bleeding gum, gum abscess, receding gum - calculus
Prosthesis	- tooth loss, position of teeth, colour of teeth - loose denture
Orthodontics	- position of teeth - deformity of face or oral cavity
TMJ treatment	- jaw clicking, jaw locking

B) Selecting subjects with a normative treatment need, who also had the specific perceived impact (specific OIDP scores).

Persons with Impact Related Treatment Needs were selected from subjects with a normative treatment need, who also had the specific OIDP score for that treatment need. The different cut-off points of OIDP score can be used to classify groups into different priority groups. This would help administrators in planning. Where resources are limited, for example, the planners might

selected higher cut-off points for OIDP score, to include serious impact related treatment needs.

In addition, within the context of OIDP scores of a sample, there should be some guidelines indicating the meaning of the OIDP scores. In a direct interpretation, persons with OIDP scores over 0 have some perceived oral impacts. However, a very low OIDP score might represent a very low perception of impact (low frequency with a low severity), which could be considered as non-significant. The appropriate cut-off points of OIDP scores were drawn from a range of scores showing the relationship in persons who had good and moderate oral conditions, and persons who reported taking hardly any trouble and fair amount of trouble with their mouths.

4.3 Assessing 'Effective Treatment Need'

Effective Treatment Need is the need which derived from a combination of professional judgement, lay people's perceived oral impacts and behavioural propensity. The process for assessing 'Effective Treatment Need' was developed by using periodontal treatment need as an example. The combining included two main procedures;

A) Identifying the criteria for behavioural propensity of periodontal treatment

The importance of behavioural propensity of people for the effectiveness of periodontal treatment studied on the basis of current concepts of periodontal disease were reviewed, as well as from the results of the present study. Bivariate statistics and Logistic regression were applied to detect the statistical significant association of possible behavioural-oriented risk factors for periodontal destruction of sample.

To define an appropriate cut-off point of the significant risk factors, the sensitivity and specificity of cut-off points in detecting periodontal destruction were calculated.

Sensitivity is defined as the probability that the test method under study gives a positive finding when the chosen validation criterion also gives a positive finding (Abramson, 1974) or *the proportion of true positives that are correctly identified by the test* (Altman, 1991).

Specificity is defined as the probability that the test method under study gives a negative finding when the chosen validation criterion also gives a negative finding or *the proportion of true negatives that are correctly identified by the test.*

The Receiver Operating Characteristic (ROC) curve was applied to decide the 'best' cut-off point in relation to the optimum of both sensitivity and specificity. ROC-analysis is often used to study characteristics properties of diagnostic tests. The analysis has been introduced to dentistry in some studies of dental decision making (Goldstein et al, 1971; Grondahl, 1979; Hanley and McNeil, 1982; Kay and Knill-Jones, 1992). This approach is to plot the sensitivity versus 1-specificity for each cut-off point. On the assumption that the 'cost' of a false negative results is the same as that of a false positive result, the best cut-off point is that which maximizes the sum of the sensitivity and specificity, which is the point nearest the top left-hand corner (Altman, 1991).

B. Selecting subjects with Impact-Related Treatment Need, who also had the acceptable level of behavioural propensity.

Persons with Effective Treatment Needs for periodontal treatment were selected from subjects with a Impact-Related Treatment Need, who also had the acceptable level of behavioural propensity, defined by the earlier procedure.

CHAPTER 5

SAMPLE CHARACTERISTICS, ORAL HEALTH STATUS, INCIDENCE OF ORAL IMPACTS AND ORAL HEALTH BEHAVIOURS

This chapter presents the basic descriptive results from the study, in relation to sample characteristics, clinical oral health status, perceived impacts from oral conditions and behavioural patterns. This descriptive information provides a general picture of the study sample as well as all the sources of information used in generating the socio-dental indicator and the model of dental treatment needs.

5.1 Sample Characteristics

The study area, Ban Phang district, is a small rural district in Khon Kaen province, Thailand. It was chosen as a typical district of the North-Eastern Region of Thailand. The district consists of 66 villages in 6 sub-districts. Total registered population in 1994 was 39,333. However, many are classified as temporary migrants. They go to work in cities, mostly as labourers, and come back occasionally to their families. Table 5.1 shows the demographic characteristics of the 501 35-44 year-old sample selected by a cluster random sampling procedure, by which 16 random villages of 4 stratified random

subdistricts were selected.

The sample was homogeneous socio-economically. The majority were married (92.4%), agricultural workers (76.8%), and had a highest education level of grade 4 (85.4%) which was the compulsory level during their education. The sample was predominantly female (65.3 %) due to the temporary migration of the males.

Table 5.1 Demographic characteristics of the 35-44 year-old Ban Phang sample

Demographic characteristics	Persons	Per cent
Sex:	*n=501*	
Male	174	34.7
Female	327	65.3
Marital status:		
Single	15	3.0
Married	463	92.4
Divorced	14	2.8
Widowed	9	1.8
Occupation		
Agriculture	385	76.8
Labour	43	8.6
Shop-owner	27	5.4
Government officer	20	4.0
Housewife	11	2.2
Employee	8	1.6
Others	7	1.4
Education: highest educational level		
None	3	0.6
Grade 4	428	85.4
Grade 6-7	32	6.4
Grade 9	13	2.6
Grade 12	11	2.2
Diploma	4	0.8
Bachelor degree	10	2.0

5.2 Oral health status

The sample had little dental caries (Table 5.2). The mean DMFT was 2.7 teeth, of which 1.6 were missing teeth and only 0.03 were filled. The majority (79.8%) had 28 or more sound teeth. Only 1.6% had less than 20 sound teeth. 27.7% of the sample were caries free. The prevalence of periodontal destruction was high, 21.5 and 90.2 percent had deep and shallow periodontal pockets respectively. 84 % had gingival bleeding in more than half of six sextants. 12 percent were clinically classified as having moderate to severe malocclusion. 9 percent had temporomandibular disorders, mainly joint clicking and self-correcting blocking of the joint. Fluorosis prevalence was quite high (20.4%) although the fluoride level in ground water in this area is very low (0.0 - 0.4 ppm.). The prevalence of fluorosis was similar to that reported for the North-Eastern region in the National Oral Health Survey (Dental Public Health, Thailand, 1990). However, most of enamel defects were very mild. Only one case needed treatment for defects. Wearing of prostheses was very rare. Only 7 subjects (1.4 %) had dentures or bridges.

Table 5.2 Oral health status of the Ban Phang sample

Oral health status and related behaviour	Value
1. Sound teeth:	
- number (%) of subjects who had;	
28 sound teeth or more	400 (79.8%)
20-27 sound teeth	93 (18.6%)
less than 20 sound teeth	8 (1.6%)
-mean (sd) sound teeth	29.1 (3.1)
2. Caries experience:	
- mean (sd) of Decayed, Missing and Filled teeth (DMFT)	2.7 (3.1)
- mean (sd) of Decayed teeth	1.04 (1.8)
- mean (sd) of Missing teeth	1.6 (2.1)
- mean (sd) of Filling teeth	0.03 (0.3)
3. Periodontal status:	
Deep periodontal pockets (>6 mm)	
-number (%) of subjects who have deep periodontal pockets involved in;	
more than half sextants (4-6)	18 (3.6%)
half or less sextants (1-3)	89 (17.8%)
no sextant of mouth	394 (78.6%)
-mean (sd) sextants that had deep periodontal pockets (0 to 6)	0.4 (1.1)
Shallow periodontal pockets (4-6 mm)	
-number (%) of subjects who have shallow periodontal pockets involved in;	
more than half sextants (4-6)	248 (49.5)
half sextants or less (1-3)	204 (40.8)
no sextant of mouth	49 (9.8)
-mean (sd) sextants that had shallow periodontal pockets (0 to 6)	3.3 (1.9)
Gingival bleeding (measured independently from calculus and periodontal pockets)	
- number (%) who have gingival bleeding involving;	
more than half sextants (4-6)	425 (84.9)
half sextants or less (1-3)	61 (12.2)
no sextant of mouth	15 (3.0)
- mean (sd) sextants that had gingival bleeding (0 to 6)	5.1 (1.5)

Oral health status and related behaviour	Value
4. Oral cleanliness -Mean (sd) plaque score (0 to 3)	0.9 (0.5)
5. Malocclusion status : -number (%) of subjects who had ; no malocclusion slight malocclusion moderate to severe	 329 (65.7%) 112 (22.4%) 60 (12.0%)
6. Temporomandibular joint conditions: - number (%) of subjects with; Normal TMJ Joint clicking Self-correct locking of TMJ TMJ dislocation Pain related to TMJ	 455 (91.0) 20 (4.0) 18 (3.6) 4 (0.8) 3 (0.6)
7. Enamel disorders - number (%) of subjects who had; None Fluorosis Hypoplasia Opacities	 394 (78.6) 102 (20.4) 4 (0.8) 1 (0.2)
8. Prosthetic status *Partial denture* - Upper - Lower *Full denture* - Upper - Lower *Bridge* - Upper - Lower	 5 (1.0) 1 (0.2) 1 (0.2) 0 (0) 1 (0.2) 1 (0.2)

5.4 Incidence of oral impacts on daily performances

73.6 % of all subjects had at least one daily performance affected by an oral impact during the past 6 months. The majority of sample (56%) had oral impacts on 1 to 3 of the 9 performances. Among affected persons, the average number of performances affected was 2.6 (Table 5.3).

Incidence, frequency and severity of oral impacts on daily performances are presented in Table 5.4. The highest incidence of affected performances were Eating (49.7%), Emotional stability (46.5%), and Smiling (26.1%). While the high frequencies (or long duration) impacts affected Eating (3.3) and Speaking (3.1) performances, the severity scores were high for Sleeping (4.3), Physical activities (3.7), and both the social performances; work or major role (3.4) and enjoyment of contact other people (3.5).

Subjects with a performance affected were asked what symptoms caused the change in performance, and the condition which caused the symptom. Pain and discomfort were the main causal symptoms of impacts (40.1 %), for almost every daily performance, except Smiling (Table 5.5). 26.3 percent reported dissatisfaction with appearance as their main symptom of impacts, mainly affecting Smiling and Contact with people. While a very low proportion complained of functional limitation (5.6%); it was a major causal symptom solely of the Speaking performance.

Toothache was the major causal impairment (32.7 %) for almost all aspects of performance. Position of teeth, tooth decayed or tooth hole, bad breath and gum abscess were impairments affecting 10 or more percent of subjects. Position of teeth (16.6%) was perceived as a main cause of impacts on Eating,

Smiling and Emotional stability. Tooth decayed (13.4%) involved mainly Eating performance. Bad breath (13.4%) affected Contact with people. While gum abscess (10.0%) was one of the prime causes of the Emotional stability performance.

Table 5.3 Frequency distribution of number of performances affected by oral problems over the past six months

Number of performances affected	Number of persons	Per cent affected
0	135	26.9
1	115	23.0
2	94	18.8
3	71	14.2
4	37	7.4
5	24	4.8
6	18	3.6
7	5	1.0
8	2	0.4
9	0	0.0

Mean (of total sample) = 1.9 , SD. = 1.8 *(n=501)*

Mean (of affected persons only) = 2.6 , SD. = 1.6 *(n=366)*

Table 5.4 The incidence, frequency and severity of oral impacts on various daily performances

Daily performances	% person affected	Mean Frequency score (0-5)	Mean Severity score (0-5)
	n =501	Of persons affected	Of persons affected
a. Eating	49.7	3.3 (1.4)*	2.9 (1.3)*
b. Cleaning teeth	20.8	2.5 (1.4)	2.6 (1.2)
c. Speaking	4.0	3.1 (1.3)	3.3 (1.6)
d. Physical activities	2.4	1.4 (0.5)	3.7 (1.3)
e. Sleeping	11.8	1.4 (0.6)	4.3 (1.0)
f. Smiling	26.1	2.4 (1.1)	2.7 (1.3)
g. Emotional stability	46.5	2.6 (1.3)	3.0 (1.4)
h. Major role activity	9.6	1.3 (0.5)	3.5 (1.4)
i. Contact with people	18.4	2.6 (1.3)	3.4 (1.3)
Total	73.6**	2.7 (1.2)	2.7 (1.2)

* *Standard deviation*

** *overall percentage of persons who had impacts affecting at least one performance (average number of performances affected per person was 1.9, SD=1.8)*

Table 5.5 Perceived causal symptoms and oral impairments relating to the affected performances

Daily performance	Main Symptoms leading to impacts			Main Oral impairments causing oral impacts		
		n	%		*n*	%
a. Eating	Pain	146	58.6	Toothache	128	51.4
	Discomfort	90	36.1	Tooth decayed	45	18.1
				Position of teeth	29	11.6
b. Cleaning teeth	Pain	61	58.7	Gum abscess	29	28.6
	Discomfort	40	38.5	Toothache	24	23.3
				Oral ulcer	13	12.6
c. Speaking	Functional limitation	12	60.0	Toothache	6	30.0
				Missing teeth	6	30.0
	Pain	7	35.0	Oral ulcer	4	20.0
d. Physical activities	Pain	12	100.0	Toothache	10	83.3
e. Sleeping	Pain	58	98.3	Toothache	53	89.8
f. Smiling	Dissatisfaction with appearance	128	97.7	Position of teeth	38	29.0
				Calculus	26	19.8
				Colour of teeth	20	15.3
				Missing teeth	19	14.5
g. Emotional stability	Pain	135	59.2	Toothache	43	48.7
	Discomfort	86	37.7	Gum abscess	27	11.8
				Position of teeth	20	8.8
h. Major role activity	Pain	47	97.9	Toothache	43	89.6
i. Contact with people	Discomfort	61	66.3	Bad breath	60	65.9
	Dissatisfaction with appearance	21	22.8	Toothache	6	6.6
				Missing teeth	5	5.4
Total:	Pain	201	40.1	Toothache	164	32.7
	Discomfort	201	40.1	Position of teeth	83	16.6
	Dissatisfaction with appearance	132	26.3	Tooth decayed/hole	67	13.4
				Bad breath	67	13.4
	Functional limitation	28	5.6	Gum abscess	50	10.0
				Calculus	31	6.2

5.4 Oral health and illness behaviour

The majority of subjects (62.1%) brushed their teeth twice daily. Almost all of the rest (34.7%) brushed their teeth once a day.

To investigate sweet preference, to estimate the tendency to sugar consumption, the estimated teaspoons of sugar added to tea/coffee was assessed. However, the dietary pattern of the samples are different from Western populations in which this question had been widely used. Even after adding the chocolate drinks, which is as popular as tea or coffee among the villagers (eg. Ovaltine, Milo), the non response rate due to uncommonness of the practice of this kind of drinking, was still high (28.7%). The supplementary question, sugar adding in noodles was selected. A noodle meal is one of the most popular meals for the eating out for rural Thai people. The basic seasoning for noodles, found on the table, is composed of sugar, fish sauce, dried chilli and vinegar. Only 3.6% did not respond to this question.

70.5 percent of subjects added sugar frequently to their tea, coffee or chocolate drinks. 40.2, 37.8 and 22.0 percent added up to 3, 4-6, and 7 or more teaspoons respectively. While 93.0 percent added sugar frequently to their noodles, of which 51.8, 25.2 and 22.2 percent usually added up to 1, 2 and 3 or more teaspoons respectively. It should be noted that, generally, Thai people add much more sugar in tea, coffee or chocolate drinks, which are considered as a kind of desert or sweet drink, than what they add to their main food such as noodle.

21.4 percent of the sample was current smokers; 6.6 percent were past smokers. Almost all of them were male (99.3 %). Some of current smokers

(22.4 %) used the self-made cigarette from local shredded tobacco instead of manufactured cigarette. Comparison between number of manufactured cigarettes and grams of tobacco could not be directly adapted by weight, since there was difference of strength between these two types of cigarette which caused different amount of smoking. From an assessment among a group who smoked both types of cigarettes, 1 manufactured cigarette per day could be equivalent to 3 grams of tobacco per week of self-made cigarette in their actual smoking manners.

Dental service utilization of this population was generally very low (Table 5.6). 57.9 percent of subjects said that they had never visited a dentist in their lives. Only one fourth had their last dental visit in the past two years and mostly, they went once. Most subjects who had dental visits during the past two years (80.6%), had attended because of pain or advanced symptoms of oral conditions.

The related oral health behaviour and attitudes provided some possible explanations of the above pattern of dental services utilization (Table 5.6). In terms of general perception of past trouble from mouth and teeth, the majority of people (63.9%) perceived only a little trouble. Only 11.2 percent said that they had a lot of trouble from oral conditions. 54 percent thought that dental treatment definitely makes their teeth and mouth healthier. Very few said that they did not believe in the benefit of dental treatments, 41.7 percent were uncertain about the good and harm from dental services. Complications from tooth extraction, particularly involving the nervous system and sight, were the most common mentioned in this regard. A quarter also reported that they are (or would be, in case of no actual experience) really frightened when they go

to a dentist. However, the majority (75.8%) still said that they would go to see dental personnel if they have dental problems. The reasons, of those who would not, were fear (47.3%), uncertainty of dental benefit and complication (37.3%), lack of time (34.5%) and cost (29.1%).

Table 5.6 Oral health behaviour of sample

	Persons (%)
1. Frequency of tooth brushing per day	
0	2 (0.4)
1	174 (34.7)
2	311 (62.1)
3 or more	14 (2.8)
2. Sugar consumption	
- Adding sugar to tea/coffee/chocolate	
Cannot answer	144 (28.7)
Never	3 (0.6)
Rarely/sometimes	1 (0.2)
Frequently	353 (70.5)
number of teaspoon added	
Up to 3	143 (40.2)
4-6	134 (37.8)
7 or more	78 (22.0)
(Mean = 5.0, SD = 3.1, Median = 4, Mode = 6, Percentile 75 =6)	
- Adding sugar in noodle	
Cannot answer	18 (3.6)
Never	20 (4.0)
Rarely/sometimes	14 (2.8)
Frequently	449 (93.0)
number of teaspoon added	
Up to 1	234 (51.8)
2	114 (25.2)
3 or more	104 (22.2)
(Mean = 1.9, SD = 1.7, Mode = 1, Median = 1, Percentile 75 = 2)	
Frequency of sweets (desert/drink) during yesterday	
0	178 (35.5)
1-2	240 (47.9)
3-4	61 (12.2)
5 or more	22 (4.4)
(Mean= 1.3, SD= 1.6, Mode =0, Median= 1)	

	Persons (%)
3. Smoking experience	
Never	361 (81.1)
Past smoker	33 (6.6)
Current smoker	107 (21.4)
number of cigarettes per day	
up to 5	19 (22.5)
6-10	29 (34.6)
11-15	14 (26.7)
16 or more	22 (26.7)
Mean = 11.7, SD =6.8, Mode=10, Median = 10, Percentile 75 = 18	
or	
grams of tobacco per week	
Up to 15	4 (14.8)
16 - 30	11 (40.7)
31 - 45	3 (11.1)
46 or more	8 (29.6)
Mean = 31.4, SD = 20.1, Mode = 50, Median = 25,	

Table 5.7 Behaviours and attitudes to dental services

	Persons (%)
1. Last dental visit	
Never	290 (57.9)
> 5 years	35 (7.0)
2+ - 5 years	54 (10.8)
1+ - 2 years	38 (7.6)
< 1 year	84 (16.8)
2. Number of dental visits in the past 2 years	
0	370 (73.9)
1	85 (17.0)
2	26 (5.2)
3 or more	20 (4.0)
3. The reasons for dental visits *(in the past 2 years)*	
Check up	6 (4.7)
Having early symptoms	24 (18.6)
Having pain or advanced symptoms	104 (80.6)
Appointment	10 (7.8)
4. Overall past trouble from mouth and teeth	
Much	56 (11.2)
Fair	125 (25.0)
Little	320 (63.9)
5. Do you think that dental treatment can help your teeth and mouth to be more healthy?	
Yes/ absolutely	271 (54.1)
Probably/ not sure	209 (41.7)
No	10 (2.0)
Don't know	11 (2.2)
6. Feeling when go to the dentist	
Really frightened	120 (24.0)
Fairly nervous	43 (8.6)
A little bit nervous	30 (6.0)
Not nervous	308 (61.5)

	Persons (%)
7. If you have dental problems, will you go to see dental personnel?	
Definitely	380 (75.8)
Probably/ not sure	16 (3.2)
No	105 (21.0)
If no or not sure, what makes it difficult for you to visit dental personnel?	
Fear	52 (47.3)
Dental benefit/complication	41 (37.3)
Time	38 (34.5)
Cost	32 (29.1)
Service availability	8 (7.3)
Impression from previous visit	7 (6.4)
Others	2 (1.8)

5.5 Discussion

The demographic, oral health status and related behaviour characteristics of the sample of rural Thais demonstrated clearly that, the sample of adults had a low dental caries and low dental services utilization. Their caries experience level was comparable to rural people in the North-Eastern region of Thailand from the National Oral Health Survey in 1994, in which DMFT of this region (including urban area) was 4.5 (Department of Dental Public Health, 1995). While the percentage of persons who had a dental visit during the past year (16.8%) was much lower than the regional or rural statistics of this age group (47.8%, 38.8%).

The incidence of oral impacts in this low dental caries population, with DMFT of only 2.7 teeth, was high. The incidence of 73.6 percent was similar to that found in studies in industrialized, high dental disease populations in which measures of multiple subjective oral impacts were used. Cushing et al (1986) found that 71 percent of factory workers in England aged 16-60 years had at least one oral impact. Locker (1992) reported that 30.5 percent of Canadian adults aged 50 years and over had chewing limitation, 37.2 percent pain, and 67.5 percent had one or more other oral symptoms. The incidences in the 30-49 years group from the Canadian study were 4.8, 36.7 and 51.8 percent, respectively (Locker and Miller, 1994).

The high incidence of oral impacts in the current study was similar to that found in a study to assess community health problems and felt needs in other districts of Khon Kaen (Na Nakorn et al, 1993). In that study, oral problems was perceived as one of the five main health problems. A similar phenomenon

was found in the recent National Oral Health Survey in Thailand, 82.2 percent of rural 35-44 year-old Thais reported having oral symptoms (tooth sensitivity, toothache or gum abscess) during the past year. Interestingly, this incidence was higher than in older age groups (60-74), or in urban areas with higher prevalences of oral diseases. Locker and Slade (1994) also found in a study of Canadian 50 year olds and over that oral disorders had their greatest impact on younger subjects and subjects with socio-economic, and general health disadvantages.

The high incidence of oral impacts affecting Eating, Emotional stability or Cleaning teeth were chronic character with high frequency or long duration, but low severity. In turn, performances which were not commonly affected, such as Physical activities, Major role activity or Sleeping, tended to cause more "acute" effects with low frequency or short duration, but high severity. The results, which showed that frequency and severity presented the paradoxical effect on some performances, provided a sound background to include both scores in developing of the indicator Oral Impact on Daily Performances.

The oral impacts on daily performances were mainly induced by pain and discomfort. The very low proportion (5.6 %) of functional limitation perceived as the causal symptom of the impacts, was similar to the 4.8 % with limitation in chewing and 6.0% with problems in speaking, in a study in 30-49 year old Canadian (Locker and Miller, 1994). Even in this low caries population, 32.7% of subject said toothache was a cause of their oral problem. However, these perceived physical causes were lay people's judgements which might be different from clinicians. Toothache, for example, might include oral

impairments from either dental caries, periodontal disease, or other oral conditions, which the subjects were not capable of differentiating.

The finding that these low caries people had as high an incidence of oral impacts as industrialized, high dental disease populations, provides more evidence of the complexity of people's perception about oral disorders. It also stresses the shortcoming of using merely universal normative judgements to estimate dental need of populations. Cross-cultural comparison studies of oral impacts and integrating subjective measures into dental need estimation are required to broaden our concepts of oral health.

There must be large barriers preventing this group of people with high impacts utilizing dental services. Apart from availability and administrative system, which were not directly investigated in this study, psychological and socio-economical difficulties obviously played a part. Fear and uncertainty of benefit versus complications from dental treatment were the major psychological barriers. While lack of time and cost were their socio-economical barriers. From additional interviews, 'lack of time' in their circumstances, also included the lack of flexibility in their jobs as well as in transportation. 'Cost' did not mean only treatment fee, but also costs of transportation and absence from work. The findings are similar to what found in studies of dental utilization in developing countries that present barriers to seeking care in rural areas are ascribed to less availability of dentists, longer travelling distances and waiting time and cultural factors. The complicated combination of these factors produced differences between normative and expressed need.

CHAPTER 6

DEVELOPING A SOCIO-DENTAL INDICATOR: THE ORAL IMPACTS ON DAILY PERFORMANCES

RESULTS AND DISCUSSIONS

6.1 Pilot study

From both open interviews and using the proposed questionnaire on a group of 36 people, the answers on impacts on daily performances were confined to the nine performances. The details of the impacts on a performance might vary. For example, impacts on eating and enjoyment of food can be "inconvenient eating from food impaction or loose tooth", "cannot eat at all because of toothache", "less food enjoyment from avoiding some particular foods". However, since people were asked to weight the severity or the trouble from the impact, these different details of impacts on eating performance could be included concisely in the same item. The additional questions on perceived causal symptoms and impairments provided similar details in case they were needed.

Reporting frequency or severity score was readily done. However, respondents found reporting frequency of an impact easier than quantifying its severity. Only small changes in the wording was required.

6.2 Main study

The descriptive results of the questionnaire were presented in Chapter 5. There were no missing data from the sample.

The inter-item Pearson correlation coefficients among the scores of 9 performances ranged from -0.02 to 0.54, with a mean of 0.19 and variance of 2.16 (Table 6.1). The correlations were not high enough for any pair of items to be redundant. There was only one negative coefficient; between "Physical activities" and "Smiling" performance. This raised doubts about the homogeneity of the scale. Factor analysis was not appropriate for this set of correlations, since the Kaiser-Meyer-Olkin measure of sampling adequacy was only 0.66, which was 'mediocre' (Norusis, 1994).

Results of test-retest reliability among each item from the 28 subjects assessed twice are presented in Table 6.2. The Kappa for frequency scoring ranged from 0.95 to 1.0 while Kappa for severity scores ranged from 0.57 to 1.0. Reliability coefficients of item scores ranged from 0.91 to 1.0. The reliability coefficient of the total OIDP score was 0.99 .

The sub-scale scores were put into the reliability analysis. The Cronbach alpha of the scale was 0.65. The standard item alpha, in which all items variances were standardized, was 0.67. The "Physical activities" item had the lowest correlation coefficient (0.16) to the adjusted total score without the Physical activities item (Table 6.3). This coefficient was lower than 0.20, which was recommended as a minimum level for including an item (Kline, 1986). When "Physical activities" performance is excluded from the scale, the alpha improved. Therefore, with these internal consistency results, as well as

the fact that the incidence of the oral impacts on "Physical activities" performance was very low (2.4% in study), and, as mentioned earlier, its correlation with the "Smiling" performance was the only negative correlation, it was decided that "Physical activities" performance item should be excluded from the scale.

The distribution of adjusted OIDP scores ranged from 0 to 50 with a mean of 7.1, standard deviation 8.5, and median 4.0. Since the frequency distribution of the scores was not normally distributed, only non-parametric tests were used. The correlation coefficient between the OIDP scores, before and after excluding the physical performance, was 0.99.

Table 6.1 Pearson correlation coefficients (p-value) among items of OIDP

	1) Eat	2) Speak	3) Clean	4) Physi	5) Sleep	6) Smile	7) Emot	8) Role	9) Cont
1) Eat	1.00								
2) Speak	0.16 (<0.001)	1.00							
3) Clean	0.32 (<0.001)	0.09 (0.04)	1.00						
4) Physi	0.06 (0..19)	0.07 (0.11)	0.02 (0.58)	1.00					
5) Sleep	0.25 (<0.001)	0.26 (<0.001)	0.12 (0.01)	0.32 (<0.001)	1.00				
6) Smile	0.20 (<0.001)	0.21 (<0.001)	0.19 (<0.001)	*-0.02* (0.68)	0.07 (0.04)	1.00			
7) Emot	0.47 (<0.001)	0.04 (0.39)	0.23 (<0.001)	0.09 (0.06)	0.30 (<0.001)	0.15 (0.001)	1.00		
8) Role	0.18 (<0.001)	0.08 (0.09)	0.11 (0.01)	0.48 (<0.001)	0.54 (<0.001)	0.03 (0.46)	0.24 (<0.001)	1.00	
9) Cont	0.17 (<0.001)	0.18 (<0.001)	0.18 (<0.001)	0.08 (0.08)	0.07 (0.10)	0.35 (<0.001)	0.32 (<0.001)	0.03 (0.46)	1.00

Performances:

1) Eating and enjoying food
2) Speaking clearly
3) Cleaning teeth
4) Physical activity
5) Sleeping
6) Smiling without embarrassment
7) Emotional stability
8) Major Role
9) Contact with people

Table 6.2 Kappa and reliability coefficients of test-retest reliability

Performances	Kappa of frequency score	Kappa of severity score	Reliability Coefficient
Eating	**0.85**	**0.86**	**0.98**
Speaking	**1.00**	**0.64**	**1.00**
Cleaning teeth	**0.92**	**0.59**	**0.91**
Physical activities	**1.00**	**1.00**	**1.00**
Sleeping	**1.00**	**0.86**	**0.98**
Smiling	**0.82**	**0.73**	**0.85**
Emotional stability	**0.84**	**0.84**	**0.97**
Role	**1.00**	**0.57**	**0.98**
Contact with people	**0.92**	**0.72**	**0.99**

Table 6.3 Reliability analysis : Item -total correlation and Cronbach's Alpha

1) Item-total Statistics

Performances items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	**Corrected Item-Total Correlation**	Squared Multiple Correlation	**Alpha if Item Deleted**
Eating	9.91	81.67	0.47	0.30	0.58
Speaking	14.02	73.67	0.24	0.14	0.63
Cleaning teeth	13.01	243.70	0.35	0.13	0.61
Physical activity	14.28	291.08	*0.16*	0.25	*0.65*
Sleeping	13.71	267.23	0.36	0.38	0.62
Smile	12.60	238.70	0.32	0.18	0.62
Emotion stability	11.05	201.92	0.49	0.34	0.57
Major role	13.96	279.59	0.28	0.41	0.64
Contact people	12.71	226.13	0.36	0.23	0.61

2) Cronbach's Alpha

Alpha = 0.6448 Standardized item Alpha = 0.6716

To investigate whether the multiplication of frequency score and severity score would add more details of impact than using only frequency or severity, the multiple regression model were applied in prediction of two major variables; DMFT and number of sextants with deep periodontal pockets. First, the method is to use all subsets regression, in which frequency, severity and OIDP scores were entered separately. The second approach was the stepwise method to select the best predictor among the three kinds of scores. The third method was to use hierarchical regression suggested by Steiner and Norman (1995), where severity and frequency scores were put into the first stage of the regression equation. Then the OIDP score was added at the later stage to see if the multiple correlation increases significantly between the two step (see Appendix 6). The results from the three approaches were compared descriptively and analytically. In addition, correlation analysis was applied to look at more details of bivariate correlation coefficients among the scores and the main oral conditions.

The three approaches of regression analysis showed similar results, that namely the OIDP score was a better predictor than either frequency or severity score separately. All subset regression model with OIDP showed the lowest mean square residuals. In the stepwise method, only OIDP was included in the equation to predict both dependent variables. However, the improvement, by multiplying frequency and severity score, was not statistically significant ($p<0.05$).

The correlation coefficient between frequency and severity score to OIDP were 0.92 and 0.87 ($p<0.001$). The correlation coefficients between OIDP score and DMFT and deep periodontal pockets (0.31 and 0.23), were similar

to frequency (0.28, 0.20) or severity score (0.29, 0.18) (Table 6.4). It should be noted that DMFT and number of sound teeth had a very high negative correlation coefficient (-0.99). In other words, DMFT and sound teeth could be considered as the inverse measurement of each other, and could be used interchangeably in this study.

In addition, the correlation table also showed that, DMFT, number of sound teeth, and number of sextant with deep periodontal pockets, were correlate to OIDP score with correlation coefficient of -0.31 to 0.31 ($p<0.001$). Perception of general health, rating from excellent to poor, had a weak, but statistically significant with OIDP score (0.10, $p=0.02$). While number sextants with shallow periodontal pockets and gingival bleeding were not significantly associated with OIDP score.

There was no statistically significant relationship between OIDP and all demographic variables, ie. sex, marital status, occupation and educational level (Mann-Whitney and Kruskal-Wallis Test at $p=0.05$) .

Table 6.4 Pearson correlation coefficients (p-value) among OIDP score, frequency score, severity score, oral conditions and general health perception

	OIDP score	Frequency score	Severe score	DMFT	Sound teeth	Deep pockets	Shallow pockets	Gingival bleeding	General health
OIDP score	1.00								
Frequency score	0.93* *(<0.001)*	1.00							
Severity score	0.88* *(<0.001)*	0.78* *(<0.001)*	1.00						
DMFT	0.31* *(<0.001)*	0.28* *(<0.001)*	0.29* *(<0.001)*	1.00					
Sound teeth	-0.31* *(<0.001)*	-0.28* *(<0.001)*	-0.30* *(<0.001)*	-0.99* *(<0.001)*	1.00				
Deep pockets	0.23* *(<0.001)*	0.20* *(<0.001)*	0.18* *(<0.001)*	-0.01* (0.82)	0.02* (0.66)	1.00			
Shallow pockets	-0.04 (0.43)	-0.00 (0.99)	-0.02 (0.70)	-0.05 (0.25)	0.04 (0.32)	-0.17* *(<0.001)*	1.00		
Gingival bleeding	0.03 (0.46)	0.03 (0.54)	0.06 (0.17)	-0.12* *(0.006)*	0.12 *(0.007)*	0.17* *(<0.001)*	0.55* *(<0.001)*	1.00	
General health perception	0.11* *(0.02)*	0.12* *(0.006)*	0.09* *(0.04)*	0.05 (0.30)	-0.04 (0.38)	0.02 (0.62)	0.07 (0.10)	0.10* *(0.02)*	1.00

* *statistical significant at p<0.05*

The OIDP scores of a subgroup with 'better' clinical oral status, in terms of number of functional teeth, decayed teeth, missing teeth, and sextants with deep periodontal pockets, were much lower than those with poorer oral status (Table 6.5). The percent increase of OIDP scores in groups with 26 or less functional teeth, 3 or more decayed, 5 or more missing teeth, and 2 or more sextants with deep periodontal pockets were 175%, 72%, 129% and 97% more respectively, compared to the better oral status groups.

Subjects were grouped into 3 groups according to their overall perception of trouble from oral problems; those who reported little, fair or very much trouble from oral conditions. OIDP scores for the three groups increased from a mean score of 3.8 in the group with "little trouble" to 10.7 and 18.4 in "fair trouble" and "very much trouble" groups; percentage increases of 184% and 384%, respectively. All the above differences in scores demonstrate construct and criterion validity, and were strongly statistically significant ($p<0.001$).

Table 6.5 Comparison of OIDP scores between groups with different levels of clinical oral status and overall perceptions

Variables	Subgroups	n	Mean OIDP score (sd)	Difference of mean score (SE)	%increase of mean score[#]	p-value
Construct validity test						
Number of functional teeth	32 teeth 26 teeth or less	131 80	4.1 (6.6) 11.1 (10.1)	7.1 (1.2)	174.9	<0.001*
Number of decayed teeth	none 3 teeth or more	282 73	5.9 (8.0) 10.2 (9.3)	4.3 (1.1)	72.6	<0.001*
Number of missing teeth	none 5 teeth or more	217 43	5.1 (6.8) 11.7 (11.6)	6.6 (1.8)	129.4	<0.001*
Number of sextants with deep periodontal pockets	none 2 sextants or more	394 55	6.4 (7.7) 12.6 (10.9)	6.2 (1.5)	96.9	<0.001*
Criterion validity test						
Overall perception of trouble from oral problems	1) little 2) fair 3) very much	55 125 320	3.8 (5.5) 10.7 (7.8) 18.4 (11.2)	1)&2) 7.0 (1.7) 2)&3) 7.6 (0.8) 1)&3) 14.6 (1.5)	184.2 71.0 384.2	<0.001**

[#] *per cent increase of mean OIDP score from the baseline score of healthier subgroup*
* *Mann-Whitney test*
** *Kruskal-Wallis test*

6.3 Discussion

The Oral Impacts on Daily Performance is a relatively short questionnaire, based on some aspects of outcomes of oral health. It focuses on impacts on performing daily activities. This approach should make it easier to achieve content validity. As Hyland (1992) pointed out, quality of life comprises several connected constructs. Any questionnaire may reflect one or more of these constructs. In the absence of baseline theoretical descriptions of quality of life, validity of the measures can be difficult to assess. Descriptive data (see Table 5.5 in Chapter 5) could provide evidence concerning the interrelationship of the "intermediate impacts" and the "ultimate impacts" suggested in the model (Figure 1). Bad breath, for example, would cause psychological discomfort, which then affecting social ability in contact with other people. Without indicating the theoretical level, impacts from different levels would be considered as independent dimensions and lead to frequent double and therefore overscoring.

The results of the test for psychometric properties, mainly in reliability and validity, of OIDP, were satisfactory. Test-retest reliability was at acceptable levels. Generally, the kappa of frequency scores were higher than severity scores. In terms of homogeneity of the items, the OIDP accomplished two basic conditions (Streiner and Norman, 1994). First, the items correlated with the total scale score (apart from "Physical activities" performance which was excluded). Second, the items were moderately correlated with each other, but not too high a coefficient, which indicated that some items were too similar and much redundancy was required. The Cronbach's alpha of 0.65 (Table 6.4) indicated good internal consistency if the recommended

>0.50 level is used (Cronbach, 1951; Ebel, 1951; Helmstater, 1964; and Cronbach et al, 1972). Some regard 0.70 as the minimum level of internal consistency reliability (Nunnally, 1978).

Redundancy of the "Physical activities" item would not only increase the scale's homogeneity, but also improve the content validity. Physical activities such as walking, cooking, dressing are not commonly affected by oral conditions.

In comparison to using solely frequency or severity score, OIDP score was a better predictor for DMFT and number of sextants with deep periodontal pockets. Therefore, in this study, OIDP score will be used to represent the perceived impacts from oral conditions of the study population. However, since the improvement of OIDP compared to frequency or severity score was not statistically significant in the prediction test, future users might consider using one of them to improve simplicity and efficiency. Since frequency and severity scores had similar predictive powers, frequency should be a better representative single choice because of its better reproducibity. In term of administration, the respondents were more comfortable with, and found reporting frequency of their impacts easier, than making judgements of severity.

The OIDP was satisfactory as regards construct and criterion validity. The scores could discriminate clearly between groups of relatively healthy and those with poor oral status, as well as between people who have different perceptions of overall oral impacts. However, construct validation is an on-going process. We have to keep on learning more about the construct,

making new predictions, and then testing them (Streiner and Norman, 1995).

The OIDP score, which had been tested for its psychometric properties, was then investigated for its correlation with clinical variables. It should be noted that OIDP score had a statistically significant correlation with variables from both periodontal disease, and dental caries status. The coverage across two main oral diseases of this indicators implied that OIDP reflected impacts from both major oral diseases.

The correlation results also showed that mild periodontal conditions, such as number of sextant with bleeding and shallow pockets, did not have a statistically significant relationship with OIDP scores. These findings implied that these conditions seldom induced impacts on daily activities. Therefore, they confirmed the achievement of a main purpose in developing this index, to screen out a minor niggling conditions which would not lead to any impact on daily performances. The results were slightly different from logistic regression model for predicting socio-dental measures, the Dental Impacts on Daily living (DIDL, Leao and Sheiham, 1996), in the same age group of Brazilian sample. In that study, the number of decayed, filled and missing teeth, and number of teeth with calculus, gingival bleeding and pockets were predictors of total DIDL scores. The wider coverage of impacts of DIDL, and a slightly different approach to analysis would be the major sources of differences.

However, the relationships of OIDP to clinical oral status, even with statistical significant associations, were weak. The correlation coefficients

between OIDP and DMFT or deep periodontal pockets in Table 6.4 were merely 0.23 and 0.31. This weak relationship was similar to many previous studies on oral impacts measures (Cushing et al, 1986; Atchison and Dolan, 1990; Chen, 1991; Locker, 1992; Locker and Miller, 1994; Locker and Slade, 1994; Leao and Sheiham, 1995). In consideration that this and all other measures were validated, the explanation for the weak association would be, as Locker and Slade (1994) suggested, that clinical indicators which measure disease, and subjective indicators which measure health, document different dimensions of human experience. Therefore, to improve understanding of oral health, following the definition of the World Health Organization focusing on well-being and functioning, not just the absence of physical disease, appropriate quantification of oral health by including impact measures with clinical status is required (Cushing et al, 1986). Consequently, the findings, based on this explanation, confirmed the advantage of integrating perceived impacts of oral conditions into normative need to generate a more holistic approach of need.

In summary, the Oral Impacts on Daily Performances measure has acceptable psychometric properties, as well as a sound theoretical basis. A distinguishing feature is that it provides a significant endpoint outcomes scale for oral conditions within a concise, reliable and valid measurement. The new alternative socio-dental indicator can be readily used in this study population, and has the potential for integrating socio-dental outcome dimensions into normative dental need estimations.

However, for general use of the indicator, further longitudinal studies of OIDP are required and should include the sensitivity of change. In addition,

it should be tested on a wider range of populations with different age ranges, disease prevalences and cultures.

CHAPTER 7

RESULTS: IMPACT-RELATED TREATMENT NEEDS

Impact-Related Treatment Need, as previously stated in Chapter 3, is the need derived from an integration of professional judgement and lay people's perceived impacts on their quality of life of oral problems. In this chapter the data on Impact-Related Treatment Need and their implications in planning will be presented in two main parts

The first part, Section 7.1 to 7.4, presents the integration process and the direct results of Impact-Related Treatment Need, such as the comparison of the number and percentage of people with normative and Impact-Related Treatment Need and priority setting of treatments according to different need approaches.

The second part, Section 7.5 to 7.6, demonstrates the implications of the Impact-Related Treatment Need approach for dental care planning in the study population in Ban Phang district.

7.1 Impact-Related Treatment Need derived from the integration of normative need and OIDP scores

The integration is performed by selecting subjects with a normative treatment need and who also had perceived oral impacts (OIDP scores). Deciding on the level of impact which needs treatment depends upon resources and priorities. There are a range of oral impacts. Therefore, different cut-off points of OIDP can be used in the integrating process to classify groups into priority groups. This would provide alternative options for administrators in planning. Where resources are limited, for example, the planners might select higher cut-off points for OIDP scores, to include only serious Impact-Related Treatment Needs.

Selection of the cut-off points of OIDP score is inevitably arbitrary. Since the score is subjective and psychological and socio-cultural in nature and will vary from group to group of study populations, the distribution of OIDP within each target population should be taken into consideration in generating cut-off points. For example, in this study, cut-off points of 5 (percentile 54) and 10 (percentile 71) were selected to demonstrate the change of need according to different perceived impact levels.

The change of number and percentage of people with need for various treatments, when identified by normative approach and Impact-Related approach of need estimation are presented in Tables 7.1 and 7.2. Generally, the percentage of people with normative need decreased when Impact-Related Need was applied with higher cut-off points (0, 5, 10). The differences varied for different kinds of treatment needs. The percent differences ranged from

0% in pulp treatment to 28.3% in root planing.

Table 7.1 Comparison of normative and Impact-Related Treatment Need at differing OIDP cut-off points in 501 Thais

Treatment		Normative need	Impact-Related need (OIDP>0)	Impact-Related need (OIDP≥5)	Impact-Related need (OIDP≥10)
Extraction	n	142	121	89	68
	%	28.3	24.2	17.8	13.6
Pulp care	n	12	12	8	5
	%	2.4	2.4	1.6	1.0
Filling	n	134	111	81	49
	%	26.7	22.2	16.2	9.8
Prosthetics	n	162	139	108	75
	%	32.3	27.7	21.6	15.0
Deep pockets	n	107	87	57	43
treatment	%	21.4	17.4	11.4	8.6
Root planing*	n	350	251	159	102
	%	69.8	50.1	31.7	20.4
Scaling	n	493	357	227	148
	%	98.4	71.3	45.3	29.5
Orthodontics	n	112	83	52	34
(mild) **	%	22.4	16.6	10.4	6.8
Orthodontics	n	60	46	31	26
(moderate/	%	12.0	9.2	6.2	5.2
severe)***					

* for subjects with shallow, and no deep periodontal pockets (CPITN3)
** for subjects with mild malocclusion
***for subjects with moderate/severe malocclusion

Table 7.2 Comparison of normative need considered as 100% with Impact-Related Treatment Need at differing OIDP cut-off points in 501 Thais

Treatment	Normative need	Impact-Related need (OIDP>0)	Impact-Related need (OIDP≥5)	Impact-Related need (OIDP≥10)
Pulp care %	100	100.0	66.7	41.7
Extraction %	100	85.2	62.7	47.9
Filling %	100	82.8	60.4	36.6
Denture or bridge %	100	82.2	66.7	46.3
Deep pockets treatment %	100	81.3	53.3	40.2
Orthodontics (moderate/ severe)*** %	100	76.7	51.7	43.3
Orthodontics (mild) ** %	100	74.1	46.4	30.4
Scaling %	100	72.4	46.4	30.0
Root planing* %	100	71.7	45.4	29.1

* for subjects with shallow and no deep periodontal pockets (CPITN3)
** for subjects with mild malocclusion
***for subjects with moderate/severe malocclusion

7.2 'General' and 'Condition-specific' impacts in treatment need assessment

Using the total OIDP score, derived from combining all impacts on daily performances to identify Impact-Related Treatment Need may not be logical. Treatment need for scaling, for example, may not have any association to the impacts caused by toothache, position of teeth or jaw locking. Thus, the Impact-Related Treatment Needs for scaling, derived by integrating the total OIDP score, would include subjects with impacts not related to periodontal diseases. To overcome that shortcoming, questions relating to causal impairment in the OIDP questionnaire were used to establish the 'Condition-Specific' OIDP score (CS-OIDP). Only oral impacts from some causal oral conditions were used to identify a specific treatment need (see Chapter 4, Table 4.1).

Comparison of the number and percentage of people with OIDP and various Condition Specific OIDP (CS-OIDP) scores showed the different numbers of people in different types of OIDP score (Table 7.3). The reduction of people with each CS-OIDP from general OIDP is related to the proportion of people who have specific causal oral conditions indicating that particular treatment. The 130 subjects with CS-OIDP for prosthetics, for example, were people who have oral impacts related to position of teeth. That is much less than the total of 365 subjects who perceived impacts from any oral condition. The condition specific application should logically adjust the Impact-Related Treatment Need value to be more valid and acceptable.

Table 7.3 Comparison of number and percentage of people with OIDP and Condition Specific OIDP (CS-OIDP) for different treatments and cut-off points

Types of OIDP score	Cut-off points		
	> 0	≥5	≥10
OIDP	365 (72.9)	231 (46.1)	150 (29.9)
CS-OIDP for extractions	318 (63.5)	192 (38.3)	122 (24.4)
CS-OIDP for fillings	244 (48.7)	155 (30.9)	93 (18.6)
CS-OIDP for pulp treatment	311 (62.1)	189 (37.7)	117 (23.4)
CS-OIDP for root planing	152 (30.3)	63 (12.6)	38 (7.6)
CS-OIDP for scaling	113 (22.6)	41 (8.1)	19 (3.8)
CS-OIDP for prosthetics	130 (25.9)	49 (9.8)	18 (3.6)
CS-OIDP for orthodontic treatment	86 (17.2)	31 (6.2)	11 (2.2)

7.3 Comparison of extent of normative and Impact-Related Treatment Need derived from Condition-Specific OIDP

When the Condition Specific OIDP was used instead of the total OIDP score to generate the Impact-Related Treatment Need, the number and pattern of people with need was considerably changed. Tables 7.4 and 7.5 show the change of number and percentage of people with need for various treatments, when identified by normative or impact-related approach of need estimation. The differences between normative and impact-related needs were large for needs for deep pockets treatment, prostheses, scaling, root planing and orthodontics (ranging from 40.2% to 21.7% of normative need) for cut-off point of 0 (Table 7.5). Moderate differences were found in treatment need for fillings (64%). While small differences were found in needs for pulp care (91.7%) and extraction (81.7%).

Similar variations of differences among treatment needs were also found by increasing cut-off points of OIDP (Table 7.6). Reduction of need from raising the cut-off points from 0 to 5, showed as percentage of cut-off point 0, ranged from 69.9% for fillings to 23.1% in orthodontics. Comparable reduction occurred when increasing the cut-off points from 0 to 10. Extractions have the smallest difference (50%) and orthodontics, the largest (12%).

Table 7.4 Comparison normative and Impact-Related Treatment Need at differing CS-OIDP cut-off points in 501 Thais

Treatment		Normative need	Impact-Related need (CS-OIDP>0)	Impact-Related need (CS-OIDP≥5)	Impact-Related need (CS-OIDP≥10)
Extraction	n	142	116	79	58
	%	28.3	23.2	15.8	11.6
Pulp care	n	12	11	7	4
	%	2.4	2.2	1.4	0.8
Fillings	n	134	83	58	35
	%	26.7	16.6	11.6	7.0
Denture	n	162	55	21	8
or bridge	%	32.3	11.0	4.2	1.6
Deep pockets	n	107	43	28	17
treatment	%	21.4	8.6	5.6	3.8
Root planing*	n	350	99	32	17
	%	69.8	19.8	6.4	3.4
Scaling	n	493	110	40	19
	%	98.4	22.0	8.0	3.8
Orthodontics	n	112	25	8	3
(mild) **	%	22.4	5.0	1.6	0.6
Orthodontics	n	60	13	3	2
(moderate/	%	12.0	2.6	0.6	0.4
severe)***					

* for subjects with shallow, and no deep periodontal pockets (CPITN3)
** for subjects with mild malocclusion
***for subjects with moderate/severe malocclusion

Table 7.5 Comparison of normative need considered as 100% with Impact-Related Treatment Need at differing CS-OIDP cut-off points in 501 Thais

Treatment	Normative need	Impact-Related need (CS-OIDP>0)	Impact-Related need (CS-OIDP≥5)	Impact-Related need (CS-OIDP≥10)
Pulp care %	100	91.7	75.0	58.3
Extraction %	100	81.7	71.1	55.6
Fillings %	100	64.0	54.5	43.3
Deep pockets treatment %	100	40.2	26.2	15.9
Denture or bridge %	100	33.9	23.5	13.0
Root planing* %	100	30.5	14.8	7.5
Scaling %	100	22.3	14.6	8.1
Orthodontics (mild) ** %	100	22.3	15.2	7.1
Orthodontics (moderate/ severe)*** %	100	21.7	13.3	5.0

* for subjects with shallow and no deep periodontal pockets (CPITN3)

** for subjects with mild malocclusion

***for subjects with moderate/severe malocclusion

Table 7.6 Comparison of Impact-Related Treatment Need at differing CS-OIDP cut-off points, CS-OIDP cut-off point of 0 considered as 100%, in 501 Thais

Treatment	Impact-Related need (CS-OIDP>0)	Impact-Related need (CS-OIDP≥5)	Impact-Related need (CS-OIDP≥10)
Pulp care %	100	63.8	36.4
Extraction %	100	68.1	50.0
Fillings %	100	69.9	42.2
Deep pockets treatment %	100	65.1	39.5
Denture % or bridge	100	38.2	14.5
Root planing* %	100	32.3	17.2
Scaling %	100	36.4	17.2
Orthodontics (mild) ** %	100	32.0	12.0
Orthodontics (moderate/ % severe)***	100	23.1	15.4

* for subjects with shallow and no deep periodontal pockets (CPITN3)
** for subjects with mild malocclusion
***for subjects with moderate/severe malocclusion

7.4 The influence of perceived oral impacts on treatment needs for anterior and posterior teeth

To investigate the influence of Impact-Related Treatment Need on treatment need for anterior and posterior teeth, four treatments, for which needs were identified at individual tooth level, were studied. Number and percentage of people with normative and Impact-Related Treatment needs for extractions, pulp care, fillings, and prosthetics were compared (Table 7.7). Apart from pulp care, treatment needs for posterior teeth were considerably higher than for anterior teeth. However, the influence of integrating perceived oral impacts into the need model showed a variety of effects among different treatments. This variety could be clearly demonstrated by the percent change of people with Impact-Related Treatment Needs from normative needs (Table 7.5) (pulp care was omitted because there were very few subjects with need in posterior teeth).

Impact-Related Treatment Need for anterior and posterior teeth extractions had similar percent difference from normative need ranging from 85.7 to 42.8% in anterior teeth and 80.9 to 39.7% in posterior teeth at cut-off point of CS-OIDP from 0 to 10. Needs for fillings and prosthetics in posterior teeth were reduced considerably more in Impact-Related Treatment Need than those in anterior teeth. Impact-Related Treatment Need for fillings in anterior teeth were 82.4 to 52.9% of normative need, but those in posterior teeth were 62.2 to 26.0%. While Impact-Related Treatment Need for prosthetics in anterior teeth were 47.4 to 18.4%, compared to 30.6 to 4.1 in posterior teeth.

Table 7.7 Comparison of normative need and Impact-Related Treatment Need for extractions, pulp treatment, fillings and prosthetics for anterior and posterior teeth

Treatment		Anterior teeth				Posterior teeth			
		Normative need	Impact-Related need (CS-OIDP>0)	Impact-Related need (CS-OIDP ≥ 5)	Impact-Related need (CS-OIDP≥10)	Normative need	Impact-Related need (CS-OIDP>0)	Impact-Related need (CS-OIDP ≥ 5)	Impact-Related need (CS-OIDP≥10)
Extractions	n	14	12	11	6	136	110	83	54
	%	2.8	2.4	2.2	1.2	27.2	22.0	14.6	10.8
Pulp care	n	9	8	5	4	3	3	2	0
	%	1.8	1.6	1.0	0.8	0.6	0.6	0.4	0
Fillings	n	17	14	12	9	127	79	55	33
	%	3.4	2.8	2.4	1.8	25.4	16.3	11.0	6.8
Prosthetics	n	38	18	11	7	147	45	17	6
	%	7.6	3.6	2.2	1.4	29.4	8.0	3.4	1.2

Table 7.8 Comparison of normative need considered as 100% with Impact-Related Treatment Need for extractions, fillings and prosthetics for anterior and posterior teeth

Treatment	Anterior teeth				Posterior teeth			
	Normative need	Impact-Related need (CS-OIDP>0)	Impact-Related need (CS-OIDP≥5)	Impact-Related need (CS-OIDP≥10)	Normative need	Impact-Related need (CS-OIDP>0)	Impact-Related need (CS-OIDP≥5)	Impact-Related need (CS-OIDP≥10)
Extractions	100	85.7	78.5	42.8	100	80.9	61.0	39.7
Fillings	100	82.4	70.5	52.9	100	62.2	43.3	26.0
Prosthetics	100	47.4	28.9	18.4	100	30.6	11.6	4.1

7.5 Impact-Related Treatment Need in dental care planning

The major advantage of using Impact-Related Treatment Need in planning dental services is that priority for resource allocation can be more systematic. High normative treatment needs are reduced proportional to the extent of their impacts on daily living. The revised treatment needs are more realistic and acceptable.

This approach is illustrated in Table 7.9. Priorities of dental treatment needs in the study population were changed when Impact-Related Treatment Need was used instead of normative need. Ranking the order of treatments according to percentage of people in need changed when different cut-off points of CS-OIDP scores were integrated into normative need. In the normative need approach, scaling and root planing were by far the commonest; 98.4%, 69.8% respectively. Need for prosthetics ranked third (32.3%). When CS-OIDP scores, cut-points of 0, 5, and 10, were integrated, the ranking of the top three changed. Scaling moved from the first to second then to third in the Impact- Related Treatment Need, with CS-OIDP of 0, 5, and 10 respectively. Need for root planing declined from the second to third, fourth and then fifth. While need for prosthetics fell from the third to fifth, and then to sixth.

Conversely, the proportion of need for extractions, fillings, treatment of deep periodontal pockets and pulp treatment increased in importance. The rank order of extractions moved from the fourth to first when either of the CS-OIDP scores were applied. While rank order of fillings rose from the fifth to fourth, and then second respectively. Pulp treatment which was bottom in normative and Impact-Related need with OIDP of 0, rose from eighth and seventh when

increasing cut-off points to 5 and 10. Need for treatment of deep periodontal pockets was the only periodontal disease- related treatment whose rank order improved with higher integrated CS-OIDP scores. Its ranking improved from the seventh to sixth, fifth and third respectively.

Orthodontic treatment for mild malocclusion was moderately ranked using normative need (22.4%, 6th position). In the Impact-Related approach, its ranking moved constantly downward toward the orthodontic treatment for moderate and severe malocclusion being at the bottom rank.

Table 7.9 Rank order of treatment needs according to percent of people in need; comparison of normative and Impact-Related Treatment Needs of differing cut-off points, in 501 Thais

Ranking	Treatment (% of people in need)			
	Normative need	**Impact-Related need** (CS-OIDP≥0)	**Impact-Related need** (CS-OIDP≥5)	**Impact-Related need** (CS-OIDP≥10)
1	Scaling (98.4)	Extractions (23.2)	Extractions (15.8)	Extraction (11.6)
2	Root planing# (69.8)	Scaling (22.0)	Fillings (11.6)	Fillings (7.0)
3	Prosthetics (32.3)	Root planing (19.8)	Scaling (8.0)	Deep pockets (3.8)
4	Extractions (28.3)	Fillings (16.6)	Root planing (6.4)	Scaling (3.8)
5	Fillings (26.7)	Prosthetics (11.0)	Deep pockets (5.6)	Root planing (3.4)
6	Ortho (mild)* (22.4)	Deep pockets (8.6)	Prosthetics (4.2)	Prosthetics (1.6)
7	Deep pockets## (21.4)	Ortho (mild) (5.0)	Ortho (mild) (1.6)	Pulp care (0.8)
8	Ortho (mod/sev)** (12.0)	Ortho (mod/sev) (2.6)	Pulp care (1.4)	Ortho (mild) (0.6)
9	Pulp care (2.4)	Pulp care (2.2)	Ortho (mod/sev) (0.6)	Ortho (mod/sev) (0.4)

\# for subjects with shallow and no deep periodontal pockets (CPITN3)
deep periodontal pockets treatment
* for subjects with mild malocclusion
** for subject with moderate/severe malocclusion

7.6 Using Impact-Related Treatment Need in dental care planning in Ban Phang district: a case study

To demonstrate the practical application of Impact-Related Treatment Need model in dental planning, the results of the present study were used for planning dental treatment services for the adult population in Ban Phang district. The plan was restricted to the need for dental treatment service, based on the Impact-Related Treatment Need approach, compared to normative need. Estimates relating to aspects of behaviour and planning dental service, which involve 'Effective' and 'Accessible' level of treatment need, were not included. To make the comparison with actual dental services for the general adult population, the extrapolation of 35-44 years data was made to encompass the population aged from 24 to 54, on the assumption that the treatment need pattern of the 35-44 year-old population was similar to adults aged 25-34 and 45 to 54 years.

Table 7.11 presents the number of estimated people in need of dental care according to various treatments, types of needs and cut-off points of CS-OIDP score. A person may need more than one type of treatment. Of the 17,852 adult population, 99.2 percent needed at least one dental treatment or 59.3 percent if scaling and orthodontic treatment for mild degree of malocclusion were not including. The total numbers of treatment for the population, not included scaling and orthodontic treatment for mild malocclusion, was 34,434; an average of 1.9 treatments per person or 3.3 per affected person. The numbers of treatment needs decreased dramatically when the Impact-Related Treatment Need were applied at CS-OIDP of 0, 5 and 10. The numbers were 14,996, 8,138 and 5,213 respectively, which were only 43%, 24% and 15% of

normative need. The application of this information in dental planning for Ban Phang district will be discussed in Chapter 9.

Table 7.10 Population in Ban Phang district, Thailand; by sex and age, 1995

Age group	Sex		
	Male	Female	Total
0-4	1,588	1,489	3,077
5-14	3,812	3,611	7,423
15-24	4,112	4,035	8,147
25-34	3948	3,882	7,830
35-44	2,903	2,909	5,812
45-54	2,081	2,129	4,210
55-64	1,256	1,402	2,658
65-74	736	837	1,573
75+	228	361	589
Total	20,664	20,655	41,319

Table 7.11 Numbers of people aged 25-54 years old in Ban Phang District, who need different types of dental treatment : Comparison of normative and Impact-Related Treatment Need *(n = 17,852)*

Treatment		Normative need	Impact-Related need (CS-OIDP>0)	Impact-Related need (CS-OIDP≥5)	Impact-Related need (CS-OIDP≥10)
Extractions	n	5,052	4,142	2,820	2,071
	%	28.3	23.2	15.8	11.6
Pulp	n	428	393	250	143
treatment	%	2.4	2.2	1.4	0.8
Fillings	n	4,766	2,963	2,071	1,250
	%	26.7	16.6	11.6	7.0
Prosthetics	n	5,766	1,964	750	286
	%	32.3	11.0	4.2	1.6
Deep pockets	n	3,820	1,535	1,000	678
treatment	%	21.4	8.6	5.6	3.8
Root planing*	n	12,460	3,535	1,143	607
	%	69.8	19.8	6.4	3.4
Scaling	n	17,566	3,927	1,428	678
	%	98.4	22.0	8.0	3.8
Orthodontic	n	3,999	893	286	107
(mild) **	%	22.4	5.0	1.6	0.6
Orthodontic	n	2,142	464	107	71
(moderate/	%	12.0	2.6	0.6	0.4
severe)***					

* for subjects with shallow and no deep periodontal pockets (CPITN3)
** for subjects with mild malocclusion
***for subjects with moderate/severe malocclusion

CHAPTER 8

EFFECTIVE TREATMENT NEED : AN EXPLORATORY APPROACH TO ESTIMATING THE NEED FOR PERIODONTAL TREATMENT

This chapter explains the process for developing 'Effective Treatment Need' using periodontal treatment need as an example. The current concept of periodontal disease and periodontal treatment are reviewed, particularly from a public health perspective. Therefore, less prevalent periodontal conditions that do not appear to be major public health problems, such as localized juvenile periodontitis, are not included. The importance of behavioural propensity of people for the effectiveness of periodontal treatment is justified on the basis of current concepts of periodontal disease, which are reviewed, as well as from the results of the present study. Finally, the process of integrating behavioural propensity into Impact-Related Treatment Need to generate 'Effective Treatment Need', is outlined and discussed.

8.1 The natural history of periodontal disease

Details of the natural history of periodontal diseases are unresolved and there are still voids in knowledge of the microbiology, immunology and tissue responses during periodontal health and disease. However, knowledge of the causes and the disease has reached a point which, for several decades, has

made possible the formulation of rational concepts for the clinical management of periodontal diseases (Löe, 1993).

The earlier model of periodontal diseases assumed that gingivitis usually progressed to periodontitis unless there was active professional intervention. Early epidemiological surveys, based on this concept, have led to the conclusion that periodontal disease has been one of the most widespread diseases of mankind (WHO, 1978). From current knowledge, there is now general agreement that gingivitis is the initial lesion in the development of chronic periodontitis and that it represents the initial stage in the process leading to advanced destruction of the periodontium. This does not mean that all cases of gingivitis progress to periodontitis (Löe, 1993). Animal and human studies indicate that not all gingivitis progresses to periodontitis. There are no currently established ways of differentiating stable gingivitis from that which will progress to destructive periodontitis (Ranney, 1993). The key question is what factors shift the balance from chronic gingivitis to one of destructive periodontitis. Gingivitis may be stable for years without evidence of progression to periodontitis (Lindhe et al, 1983; Buckley, 1984).

The burst theory of periodontitis (Socransky et al, 1984), states that periodontitis progresses in a series of relatively short, acute bursts of rapid tissue destruction, followed by some tissue repair and with long periods of remission (Lisgarten, 1986). This view was the converse of the linear progression model. Clark and Löe (1993) concluded that the best model of disease progression has not been found. The burst hypothesis of periodontal disease progression has yet be proven. Although some data support this hypothesis, in the past few years a number of criticisms have been made by

various investigators, and several alternative models of disease progression have been proposed. However, from an predictive power analysis of several statistical models for periodontal attachment changes from longitudinal study on 1,061 sites of 8 subjects for one year, Yang et al (1992) found that none of the suggested models could fully explain the variation in the data. The observed differences in the rates of progression and prevalence of destructive disease seen in the different populations suggest that perhaps different models operate in different individuals or populations (Clark and Löe, 1993).

In population studies, clinical and epidemiologic evidence indicates that only a small proportion of persons exhibit severe, widespread periodontitis. This appears true even when oral hygiene is poor, gingivitis severe and professional treatment limited (Burt, 1988; Brown and Löe, 1993). There was consensus at the European Economic Commission Workshop on Public Health Aspects of Periodontal Disease (Fransen,1984) that severe periodontal disease occurs in a few teeth in a relatively small proportion of people in any given age cohort. And the periodontal condition of some populations in industrialized countries has improved considerably (Miller et al, 1987). Periodontal diseases are no longer responsible for the majority of teeth lost in adults (Ainamo et al, 1984; Cahen et al, 1985; Bailit et al, 1987; Brown et al, 1989, Morita et al, 1994) and that this seems to coincide with a significant improvement in personal oral hygiene during the second half of this century (Löe, 1993).

8.2 Periodontal treatment in a public health perspective

No new clinical procedure for the non-surgical and surgical treatment of moderate or advanced periodontal disease has been introduced in the past 40 years. Subgingival scaling with instruments of traditional design is still the

mainstay of periodontal therapy. Surgical elimination of periodontal pockets using gingivectomy or flap procedures has been in use for the last century (Löe, 1993).

According to the earlier epidemiological studies based on conventional concept of periodontal disease, there is a large need estimated for normative treatment for periodontal disease in any population group. The need is always unrealistic and beyond the resources available. For example, a report of a study in Dental Manpower for North Carolina (Bawden and DeFreise, 1981) showed that 602,000 hours of dentists' time was needed per year to treat periodontal disease and 44,000 hours in addition for treating the new incidence for the population of the state. Over 1 million people needed periodontal treatment and almost 400,000 required advanced treatment. However, the report also showed that the current annual services for periodontal treatment was 126,000 hours and demand was about 13%. Oliver et al (1989) also estimated 120-130 million hours annually of periodontal treatment needs for the US adult population; of which 89% was for prophylaxis, 8% for scaling and root planing and 3% for surgery. The annual cost was 5-6 billion US dollars. The discrepancies between need and resources is worse in developing countries. A study of manpower for periodontal treatment in Thailand (Dusadeepan, 1986) using CPITN and WHO guidelines estimated a need for 21,910 personnel, working full-time on periodontal care. In 1986, the total number of dental personnel in Thailand was under 3,000. A similar study in Kenya (Manji and Sheiham, 1986), estimated that 1,432 to 4,297 working year would be required to provide periodontal treatment. It was also estimated that Kenya's 200 dentists would require between 7 to 21 years to provide treatment for just one cohort of 5-15 year-olds. In dental treatment need projection of

the West Malaysian Population (Kadir, 1992), 8.2 million hours per year was estimated for periodontal treatment. While the number of registered dentists in Malaysia in 1989 was only 1401 and the budget proportion of the Dental Division was approximately constant over the decade.

However, the current concept that most gingivitis does not progress to periodontitis has raised the question about the need for regular professional prophylaxis. It was shown that the mineralized part of both supragingival and subgingival calculus are not in contact with the periodontal tissues, and that calculus is invariably covered by a soft, non-mineralized plaque that lies in immediate contact with the epithelial cells of the gingival sulcus (Waerhaug, 1952). Pilot (1980) concluded that in gingival inflammation without loss of connective tissue attachment, proper oral hygiene may eliminate the disease. Professional care may not be necessary in all cases. Particularly, from the public health viewpoint, it should be considered that there is no populations or major group of individuals who, in the absence of active prevention or removal, go through life without calculus (Kornman and Löe, 1993). A workshop on Public Health Aspects of Periodontal Disease (Frandsen, 1984) considered that it is unrealistic, and possibly undesirable, that the public responsibility should be to eliminate incipient gingival inflammation.

For gingival inflammation combined with loss of connective tissue attachment, non-surgical treatment has been shown to be effective in eliminating inflammation, reducing probing depth and maintaining acceptable attachment levels. In areas of inaccessability of root surfaces, surgical flaps may be needed to achieve access (Frandsen, 1984). Evaluation of the various therapeutic modalities have shown that whether the competent clinician treats

the advanced lesion surgically or non-surgically makes no major difference (Rosling et al, 1976). Antczak-Bouckoms (1993) used meta-analysis method to analyse five studies comparing surgical and non-surgical periodontal treatment. The results showed that surgical treatment offered a greater benefit in consideration of pocket depth reduction, and in increase of attachment loss only for pockets with an initial pocket depth of 7 mm or more. Non-surgical therapy resulted in a greater increase in attachment level than surgical therapy for the initial pocket depth less than 7 mm. Antczak-Bouckoms and Weinstein (1987) used quality-adjusted tooth years as an outcome measure to evaluate alternatives of periodontal control. The decision analysis favoured conservative, non-surgical approaches for all levels of disease severity. The most cost-effective method was non-surgical treatment for teeth with 4-6 mm pocket depth and $\geq$10 mm loss of attachment by general dentists, while the least cost-effective was for teeth with $\leq$3 mm pocket depth and no loss of attachment. Matthews and McCulloch (1993) used patient's perception as outcomes to compare surgical and non-surgical periodontal treatment and showed that patients experienced postoperative discomfort such as pain, swelling, and dissatisfaction with aesthetics and functional limitation twice as often from surgical compared to non-surgical treatment.

High-risk individuals for periodontal treatment need can only be identified by having excessive loss of attachment. They represent only a small part of a population (Oliver et al, 1993). While the rest can maintain their dentitions through a population strategy that focuses on educating the public to improve their periodontal awareness and oral hygiene (Sheiham, 1991).

8.3 Assessing the propensity of people for Effective Periodontal Treatment Need

To maintain treatment results, regular maintenance care has been demonstrated to be mandatory for preventing the recurrence of periodontal disease. The maintenance of periodontal health implies that a state of health has been achieved following periodontal treatment. Failure to achieve health may preclude subsequent success and progressive disease would be inevitable (Kieser, 1986). The skilful performance of both the patient and operator is essential for the efficacy of any treatment (Pilot, 1980).

In decision-making for dental treatment, prognosis or the potential for long-term survival of teeth is always used as a guideline (Newman et al, 1994). Prognosis, as an epidemiological expression, is a prediction of the future course of the disease in terms of disease outcomes following its onset and/or treatment (Fletcher et al, 1988). Frequently, the factors associated with a poor prognosis are the same as those associated with increased risk, which generally refers to the probability that some unfavourable or unwanted outcome might occur in the future. For periodontitis, the role of local (Kornman and Löe, 1993) and systematic factors (Genco and Löe, 1993) which can be identified as risk markers or can affect its prognosis were recently reviewed. They are:

- Plaque accumulation, maturation of marginal plaque, oral hygiene
- Tooth malposition, tooth anatomy, gingival contours,
- Restorations,
- Presence and quantity of certain bacteria,
- Host defences,
- Pocket depth,

- Subgingival environment,
- Calculus,
- Smoking
- Inflammation,
- Aging
- Race, genetic influence
- Socio-economic status
- Systemic diseases such as, diabetes mellitus, AIDS, osteoporosis, Down's syndrome
- Pregnancy and female sex hormones

Some authors suggest a holistic approach which combines lifestyle in health, rather than only standard risk factors (Kickbush, 1986; Health Education Unit, WHO, 1986; Blaxter, 1990). Schou et al (1990) found in Scottish schoolchildren that health perception, smoking and drinking habits, eating habits, bedtimes, and video-watching were inter-related and related to tooth brushing frequency. Combination of healthy lifestyle in this study demonstrated a higher frequency of tooth brushing. A recent study in 55 year old Finnish, also showed that periodontal pocketing increased with an unhealthier lifestyle, which is the combination of dietary habits, smoking habits, alcohol consumption and physical activity (Sakki et al, 1995). However, these observed inter-relationships between sets of behaviours have not always been found consistently and may vary over time (Mechanic, 1979). Even though the lifestyle approach seems to be useful for health promotion, to include indirect risk behaviours, such as, physical activity in dental treatment planning would be complicated. Thus, only a combination of direct behavioural risk factors were considered in developing behavioural propensity

for periodontal treatment.

Of behavioural-oriented risk factors, plaque control and smoking are the most important (Kornman and Löe, 1993; Genco and Löe, 1993). In the present study, plaque score and smoking also had the strongest association with periodontal destruction (Table 8.1). These two factors are reviewed in more detail below.

8.3.1 Plaque Control

When complex periodontal treatment is contemplated, the feasibility of maintaining a state of health depend upon the patient's ability to carry out effective cleaning prior to treatment (Kieser, 1986). There is strong scientific evidence that plaque control is the essential factor in the prevention and treatment of periodontal disease (Pilot, 1980; Preber and Bergstrom,1990). Early studies on the susceptibility of the alveolar bone to surgical trauma showed that plaque re-infection would seriously affect the benefit of any surgical method (Bergstrom and Henrikson, 1974; Rosling et al 1976). Pilot (1980) concluded, in the analysis of effectiveness of periodontal treatments, that all studies indicating success have reported meticulous oral hygiene. Type of periodontal surgery does not appear to be of prime importance. Pilot's evaluation suggested that periodontal surgery should never be carried out before patients have demonstrated willingness and be capable of maintaining a clean dentition.

It is generally accepted that supragingival plaque can be eliminated, reduced or modified by means of simple mechanical or chemical measures. Mechanical plaque control, including cleansing of the dentition with

toothbrush, floss, and toothpicks, has been shown to be effective in maintaining periodontal health, in controlling gingivitis and preventing the development of periodontitis (Löe, 1993). Since gingivitis seems to be a non-specific inflammatory process with which over 70 different species of bacteria have been associated (Moore, 1982), periodontal disease prevention must still be based on non-specific control of bacterial plaque deposits (Burt, 1988; Sheiham, 1996). Beyond a certain level of plaque, which is compatible with no progression of gingivitis to severe periodontal disease, the more plaque the more severe the periodontal disease (Sheiham, 1991). Burt (1988) explored the level of non-specific plaque compatible with oral health by analysing data from the NHANES I national survey (Burt et al, 1985). The results showed that oral hygiene levels of people at all ages who had 25 or more teeth present were remarkably similar and suggested that an oral hygiene level that corresponds to OHI-S scores of 0.3-0.6 might be compatible with tooth retention throughout life. Claffey et al (1990) demonstrated that when plaque was present at more than 75% of 8 examinations during a 2-year period following surgical therapy, the predictability for probing attachment loss was 15%. Newman et al (1994) showed in their evaluation for predictive treatment model that the patient's post-treatment plaque control level was strongly associated with treatment success. 75% of patient with good plaque control, defined as less than 10% of their teeth surfaces with plaque, had successful outcomes. While only 55.6% of the patients with moderate or worse plaque control were associated with treatment success.

8.3.2 Smoking

There is abundant evidence of association between smoking and periodontal disease (Pindborg, 1947; Arnö et al, 1958; Solomom et al, 1968; Sheiham,

1971; Lasvstedt, 1975). More recent studies have shown that smokers have more calculus, staining, deeper pockets and more bone loss, but less clinical inflammation than the non-smokers (Rivera-Hidalgo, 1986; Kornman and Löe, 1993; Schenkein et al, 1995). Even in subjects with good oral hygiene, smokers had significantly more bone loss than non-smokers (Bergstrom and Eliasson, 1987; Bergstrom et al,1991). Bergstrom et al (1991) demonstrated an average periodontal bone reduction of 0.7 mm in smokers and 0.4 mm in non-smokers. These studies suggest that smoking may have a substantial modifying effect on the process of connective tissue destruction once it has been initiated (Kornman and Löe, 1993). However, plaque level in smokers has been inconsistently reported as less (Feldman et al, 1983), the same (Alexander, 1970; Bastian and Waite, 1978; Bergstrom, 1989) or more (Preber et al, 1980; Modeer et al, 1980; MacGreger and Rugg-Gunn, 1984). Smoking was found to be related to less favourable tooth brushing performance (MacGregor and Rugg-Gunn, 1984; Sakki et al, 1995). In a study of periodontal pathogens, Preber et al (1992) showed that smokers and non-smokers do not differ in the relative frequency, or different combinations of periodontal pathogens. This suggests that smoking mainly exerts a systemic influence rather than primarily adding to local destructive factors. However, it is likely that the combined effect from smoking and plaque infection is more destructive than either factor alone (Bergstrom et al, 1991).

Smoking has been associated with a decreased healing rate of duodenal ulcers (Lam and Koo, 1983), rhytidectomies (Riefkohl et al, 1986) and surgical removal of impacted teeth (Sweet and Butler, 1979). In periodontal treatment, studies have demonstrated that the outcome of various therapeutic modalities is significantly compromised in smokers compared with non-smokers (Preber

and Bergstrom, 1990; Jones, 1992; Ah et al, 1994). Preber and Bergstrom (1990) found less probing depth reduction in smokers after 12 months follow-up of surgical therapy. The difference was strongly significant even accounting for plaque. MacFarlane et al (1992) indicated the higher prevalence of smoking in patients at high risk of recurrent refractory periodontitis. In the 4 weeks to 6 years follow up for patients of 6 periodontal treatment methods, Ah et al (1994) showed that smokers exhibited less gain of attachment level in every follow up periods.

Mendel (1994) concluded from epidemiological and case-control studies, that smoking is an important risk factor for attachment loss and loss of supporting alveolar bone in adult periodontitis. In the evaluation of a representative sample of the United States population as part of the National Health and Nutrition Examination Surveys, Ismail et al (1983) evaluated the relationship of smoking to periodontal disease in 3000 individuals. The results suggests that current smoking has an independent direct association with periodontal disease, although less strong than the association of oral hygiene and age with periodontal disease. However, after controlling for oral hygiene, age, and the other confounding factors, the past smoker had higher but not significantly different Periodontal Index scores than the non-smokers. There were no significant differences in the current smokers with different types of tobacco (cigarettes, cigars and pipe), duration of smoking (15 or fewer years and more than 15 years) or number of cigarettes smoked per day (one package or less and more than one package). Bergstrom et al (1991) found in 24-60 year old Swedes that subjects smoking more than 10 cigarettes per day exhibited more bone loss than those smoking less. Three recent studies of risk factors for periodontal disease in elderly populations in Iowa (Levy et al, 1987), North

Carolina (Beck et al, 1990) and Ontario (Locker and Leake, 1992) showed that smoking was the only one factor which survived multivariate analysis. Locker and Leake (1993) found that the odds ratio of having a history of smoking and currently smoking groups were 2.3 and 2.7 respectively for predicting the sites with periodontal attachment loss of 2 mm or more.

8.4 Association between periodontal pockets and behaviour-related factors in the present study

A universal standard of behaviour-oriented propensity for effective periodontal treatment has not been established. Perhaps it is quite difficult due to variation of periodontal disease progression in different groups of population. To define broad guidelines for appropriate behaviour propensity for effective periodontal treatment need based on the data of the present Thai study population, the actual results of association between periodontal conditions and behaviour-related risk factors was taken into consideration in combination with results from in the literature review. An acceptable target of periodontal status was set as having 2 or less sextants with pockets. This level was modified from WHO's suggestion for acceptable levels of periodontal status in 35-44 years population, as 'less than 7 teeth with pockets >4.5 mm' (WHO, 1982).

Table 8.1 presents results of the analysis from the present study of the relationship between major behavioural factors and periodontal pockets. The mean number of sextants affected, percent of subjects affected and odds ratio of any pockets, 3 or more sextants with pockets, and deep periodontal pockets were used as outcomes for comparison with the risk variables. Results show that plaque score (Greene and Vermillion, 1964), either at cut-off points of 0.6

or 0.8, and current smoking were strongly associated with the presence of periodontal pockets. While no significantly association was found for frequency of toothbrushing, past smoker, number of cigarette per day and last dental visits. Number of dental visits (more than 2 times) during the past two years had the adverse association with deep periodontal pockets.

Table 8.1 Associations between periodontal pockets and behaviour-related variables in 501 Thais

Independent variables		Periodontal pockets			Periodontal pockets ≥3 sextants			Deep periodontal pockets		
		Mean sextants affected	% Subjects affected	Odds Ratio	Mean sextants affected	% Subjects affected	Odds Ratio	Mean sextants affected	% Subjects affected	Odds Ratio
Plaque score	≤ 0.6	2.6	82.2	4.6***	0.5	48.5	4.4***	0.2	12.9	2.3**
	> 0.6	4.3***	95.5**		0.8***	80.7***		0.6***	25.7**	
	≤ 0.8	2.9	84.2	6.0***	0.5	53.5	4.6***	0.3	14.9	2.1**
	> 0.8	4.5***	97.0***		0.8***	84.2***		0.6***	27.1**	
Tooth brushing frequency	≤ 1 times/day	4.0*	94.5	0.5	0.7	71.6	0.9	0.6	26.1	0.7
	≥ 2 times/day	3.6	89.5		0.7	68.6		0.4	18.8	
Current smoker	Yes	4.8***	97.2*	4.0*	0.85***	86.0***	3.2***	0.9***	35.5**	2.6***
	No	3.4	89.6		0.65	65.4		0.3	17.6	
Past smoker	Yes	3.8	93.9	1.9	0.7	69.7	1.2	0.3	18.2	1.0
	No	3.4	89.2		0.7	65.0		0.3	17.5	
Number of cigarette/day	≤ 10	4.9	98.0	0.2	0.9	87.8	0.7	0.6	28.6	1.4
	≥ 11	4.6	91.9		0.8	83.8		0.8	35.1	
Last dental visit	More than 2 yrs	3.8	90.8	1.3	0.7	71.0	0.8	0.4	21.6	0.9
	Within last 2 yrs	3.6	92.6		0.7	65.6		0.6	20.5	
Number of dental visit in past 2 yrs	0-1	3.6	91.8	1.3	0.7	65.9	0.9	0.4	15.3	2.4*
	≥ 2	3.5	93.5		0.6	63.0		0.9*	30.4*	

*$p<0.5$ **$p<0.01$ ***$p<0.001$

Further analysis showed that the mean plaque score of people who did not have any periodontal pockets was 0.51, with a 95% confidence interval of 0.41 to 0.60. While the mean plaque scores of people who have 1, 2, 3, 4, 5 and 6 sextants with periodontal pockets were 0.65 (CI 0.53-0.77), 0.71 (0.60-0.82), 0.79 (0.68, 0.90), 0.80 (0.71, 0.90), 1.0 (0.92, 1.09), and 1.17 (1.09, 1.25) respectively. To define an appropriate cut-off point, the sensitivity and specificity of cut-off points from 0.1 to 1.0 of plaque scores in detecting the subjects who have 3 or more sextants with pockets were calculated (Table 8.2).

There was an increase of specificity, but a decrease in sensitivity when the cut-off point was increased from 0.1 to 1.0 (Table 8.2). There was the same number of subjects for the cut-off points of 0.2 and 0.3; 0.5 and 0.6; and 0.7 and 0.8. Thus, only the higher of the two cut-off points was included in the selection.

Since no general rules exist for satisfactory sensitivity and specificity, a graphical approach of the Receiver Operating Characteristic (ROC) curve was applied to decide the 'best' cut-off point in relation to the optimum of both sensitivity and specificity. This approach is to plot the sensitivity versus 1-specificity for each cut-off point. On the assumption that the 'cost' of a false negative results is the same as that of a false positive result, the best cut-off point is that which maximizes the sum of the sensitivity and specificity, which is the point nearest the top left-hand corner (Altman, 1991). ROC curve showed that plaque level at 0.8 should be the best cut-off point for predicting subjects with 3 or more sextants of periodontal pockets (Figure 8.1). In other words, based on this study population, having a plaque score under 0.8 could

be recognized as a criteria for acceptable behavioural propensity for effective periodontal treatment. This group represents the lower 55th percentile of the distribution of plaque scores.

In the step-wise logistic regression analysis, three behavioural-oriented variables showing bivariate associations with periodontal pockets. They are plaque score (at cut-off point of 0.8), current smoking and number of dental visits in past 2 years. The three were tested by logistic regression for predicting periodontal pockets with 3 sextants or more. The results indicated that both plaque level at cut-off point of 0.8 and current smoking emerged as predictors in the regression model, while number of dental visits was not included. The model predicted 73.6% of cases. Odds ratio of smoking was 3.6 which is lower than the odds ratio of plaque level (4.6). The logistic regression confirmed that, based on the results from this study, smoking has a direct effect on periodontal destruction, independently of oral hygiene.

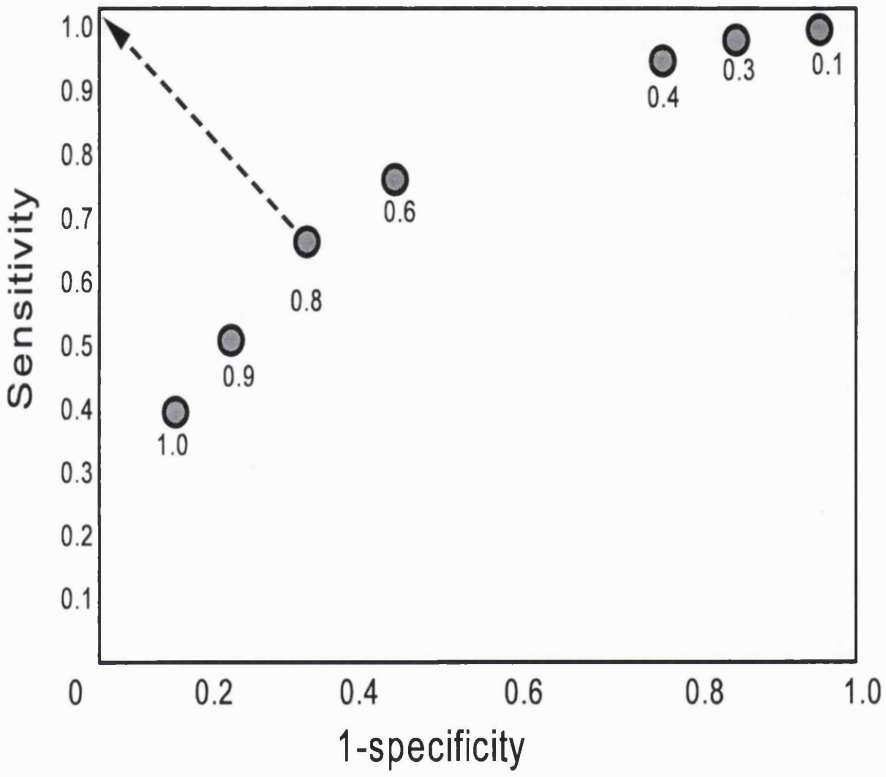
Based on the above estimations, which is similar to what found in reviewed studies, the suggested Effective Periodontal Treatment Need approach defines people who are non-smokers with a plaque index of 0.80 or lower as having acceptable behavioural propensity for periodontal treatment. This criteria was used in integrating propensity to generate the data for an exploratory estimate of Effective Periodontal Treatment Need in the study population.

Table 8.2 Sensitivity and specificity of different cut-off points of plaque score for predicting subjects with periodontal pockets in ≥3 sextants

Cut-off point of plaque score	(a) True positive	(b) False positive	(c) False negative	(d) True negative	Sensitivity*	Specificity#
0.1	345	137	1	11	1.00	0.07
0.2	340	128	6	20	0.98	0.14
0.3	340	128	6	20	0.98	0.14
0.4	330	116	16	32	0.95	0.22
0.5	267	64	79	84	0.77	0.57
0.6	267	64	79	84	0.77	0.57
0.7	224	42	122	106	0.65	0.72
0.8	224	42	122	106	0.65	0.72
0.9	186	33	160	115	0.54	0.78
1.0	137	20	209	128	0.40	0.87

* *Sensitivity = a/ (a+c)*
\# *Specificity = d/ (b+d)*

Figure 8.1 ROC curve of different cut-off points of plaque score



8.5 Effective Treatment Need for periodontal disease

The comparison of subjects with Effective Treatment Need for normative and Impact-Related Treatment Need for periodontal treatment showed a clear further reduction of people who have Effective Treatment Need (Table 8.3). Simple scaling or oral prophylaxis for subjects without periodontal destruction was excluded from the estimation of need at this level due to consideration of effectiveness, as reviewed earlier. The percentage of people who were considered as having Effective Periodontal Treatment Need for root planing decreased to only 6.2, 1.8 and 0.6 for cut-off CS-OIDP of 0, 5 and 10 respectively. While the percentage of people who needed treatment for deep periodontal pocket treatment was under 2 per cent.

Effective Treatment Need for periodontal treatment (CS-OIDP>0) was only 8-9% in comparison to normative need (Table 8.4). When the CS-OIDP cut-off points was raised up to 10, Effective Treatment Needs for root planing and deep pockets were only 5.6 and 0.8 per cent respectively. The data also indicated that only a minority of people who have impact-related treatment need (approximately one-fourth to one-third) had an acceptable level of behaviour propensity.

The number of people aged 25-54 in Ban Phang district with periodontal treatment need was estimated (Table 8.5). The estimated number with Effective Treatment Need for root planing was 926, 214, and 107, according to cut-off CS-OIDP points of 0, 5, and 10 respectively. 214, 143 and 107 had Effective Treatment Need for deep periodontal pockets. The numbers of people who have Effective Treatment Need in this district were compared to

the actual dental treatment services in this district, as well as in North-Eastern Region of Thailand in the discussion in Chapter 9.

Table 8.3 Comparison of number and percentage of people with normative, Impact-Related and Effective Treatment Need for periodontal treatment in 501 Thais

Treatment	Normative need	Impact-Related Need (CS-OIDP>0)	Effective Need (CS-OIDP>0)	Impact-Related Need (CS-OIDP≥5)	Effective Need (CS-OIDP>5)	Impact-Related Need (CS-OIDP≥10)	Effective Need (CS-OIDP>10)
Deep pockets	107	43	6	28	4	17	3
treatment	21.4	8.6	1.2	5.6	0.8	3.8	0.6
Root planing	350	99	26	32	6	17	3
(CPITN3)	69.8	19.8	5.2	6.4	1.2	3.4	0.6
Scaling	493	110	-	40	-	19	-
	98.4	22.0		8.0		3.8	

Table 8.4 Comparison of percentage normative, Impact-Related and Effective Treatment Need for periodontal treatment in 501 Thais

Treatment	Normative need	Impact-Related Need (CS-OIDP>0)	Effective Need (CS-OIDP>0)	Impact-Related Need (CS-OIDP≥5)	Effective Need (CS-OIDP>5)	Impact-Related Need (CS-OIDP≥10)	Effective Need (CS-OIDP>10)
Deep pockets treatment	100	40.2	8.4	26.1	6.5	15.9	5.6
Root planing (CPITN3)	100	28.3	8.9	9.1	3.0	4.9	0.8

Table 8.5 Numbers and percentage of people aged 25-54 years old in Ban Phang District (1995), who need dental treatment : Comparison of normative, Impact-Related and Effective Treatment Need *(n = 17,852)*

Treatment		Normative need	Impact-Related Need (CS-OIDP>0)	Effective Need (CS-OIDP>0)	Impact-Related Need (CS-OIDP≥5)	Effective Need (CS-OIDP≥5)	Impact-Related Need (CS-OIDP≥10)	Effective Need (CS-OIDP≥10)
Deep pockets	n	3,820	1,535	214	1,000	143	678	107
treatment	%	21.4	8.6	1.2	5.6	0.8	3.8	0.6
Root planing	n	12,460	3,535	926	1,143	214	607	107
(CPITN3)	%	69.8	19.8	5.2	6.4	1.2	3.4	0.6
Scaling	n	17,566	3,927	0	1,428	0	678	0
	%	98.4	22.0	0.0	8.0	0.0	3.8	0.0

CHAPTER 9

GENERAL DISCUSSION

Even though there is considerable criticisms of traditional dental need approaches and suggestions for changes in various ways during the past two decades, no comprehensive model linking the major contemporary concepts of dental need has been introduced. The theoretical approach of dental treatment need proposed here attempts to extend the scope of traditional dental treatment need both in terms of a theoretical and practical basis for dental care planning.

The present approach provides the multi-dimensional levels of dental treatment needs, including the broader aspects of perceived oral impacts from lay people, behavioural propensity for health gain from dental treatments and environmental factors relating to dental treatment utilization.

A socio-dental indicator, Oral Impacts on Daily Performances (OIDP) was developed to provide the aspect of perceived oral impacts to the system. The specific qualification of the measure add advantages for planning purpose by detecting only serious oral impacts, as well as generating a single score. Particularly, the condition specific score (CS-OIDP), which reflects the impact

from specific oral conditions, provides added appropriateness for Impact-Related Treatment Need estimates.

The procedure to justify Effective Treatment Need for periodontal treatment was demonstrated. The implication of this level of need highlights the essential combination of health promotion to enhance the behavioural propensity of people for the effectiveness of dental treatment.

It was suggested and demonstrated that the new approach could provide the planner in dental public health with a wider range of stratified priority groups according to the variables mentioned. Thus, this should assist the planner to develop a more realistic plan based not only on clinical data, but also in-depth information of value and behaviour within a particular group of people.

This chapter presents the discussions of the present study, mainly focusing on the process and results of the proposed dental treatment need approach. The topics which have been discussed in previous chapters, such as sample characteristics, oral health status, incidence of oral impacts, oral health behaviour, and the developing of OIDP are not discussed. The discussion comprises eight sections relating to methods, normative treatment need, Impact-Related Treatment Need, Effective Treatment Need, situation analysis of dental treatment needs in Ban Phang district, the proposed socio-dental approach of dental treatment need, summary and conclusion, and implication for future research.

9.1 Methods

9.1.1 Sampling

The study population was selected as a typical rural district people in North-eastern region of Thailand. Generally, in small rural districts, there is not much diversity of demographic characteristics among people. This was found in the study population. Since a high homogeneous of population require less sample than the heterogenous group, the representative sample of 501 subjects from 16 villages in 4 subdistricts should cover the variety of major demographic characteristics of the study population. In turn, the study has limitation for wider comparison across demographic and socio-economic variables. The low prevalence of oral disease of the population limits generalization in some study of need, such as, need for full dentures. Only a small minority of the sample (1.6%) had less than 20 sound teeth and only 6 upper and 2 lower full dentures were needed, which is too small for further analysis. Nevertheless, as the target group of the study is rural adult Thais, this limitation should be acceptable. There was under-sampling of men due to the temporary migration. This does not affect the response of oral impacts, but underestimates periodontal pockets and overestimates missing teeth in the overall data.

9.1.2 Oral examination

Inter-examiner variability which is a major complicating factor in oral examinations, was eliminated in the present study by using only one examiner to examine all subjects. Replicate examinations were done on 41 subjects (8.2%). Kappa statistic of intra-examiner reliability of periodontal conditions ranged from 0.55 to 1.0, and of caries status ranged from 0.61 to 0.75,which

were at fair to excellent levels of agreement. Kappa statistics in this study were calculated from examination units rather than clinical units. For example, the agreement between two examinations in recorded caries status codes of each tooth was directly obtained, instead of analysing the agreement of D, M or F values. The latter approach could provide less complicated results but less accuracy in detecting the reliability of examination.

9.1.3 Interviewing

To monitor the quality of the interview data, the questionnaire had been carefully translated and adapted to Thai language through the process of expert consultation and field testing. There were some problems dealing with the consistency of interviewing. The crucial difficulty was that the majority of subjects were in low socio-economic status who were not familiar with answering formal questions. A semi-structured interview had to be used in some subjects to make sure that they are really understood the questions and gave the appropriate answers relating to their experiences. The main modifications were, starting with an introduction and general conversation to make the subject feel comfortable; encouraging subjects regularly to ask for clarification if there was any question which they could not understand; using local dialect instead of standard Thai or simplifying or additional wording for subjects who seemed to have problems with the original wording of the questionnaire; giving examples of possible impacts on daily activities; asking extra questions to confirm the previous questionable answer. These adaptations were kept to a minimum and were applied only for particular conditions. The ultimate purpose of the approach is to gain as much consistency of understanding level of questions and validity of answers from the subjects as possible.

9.2 Normative treatment need

Even in this low disease population, there was a relatively high normative treatment needs. The normative estimation was very high in comparison to the actual dental services provided in the district, particularly for periodontal treatment, prosthesis and orthodontics. This comparison in the study population is presented and discussed later in Section 9.4.

The study age group (35-44 years) is not the appropriate group for orthodontic treatment planning. The criteria of treatment need used in this study are recommended by the WHO (WHO, 1987) which classifies the status of malocclusion into mild, and moderate to severe. This index has been used for comprehensive oral health survey, probably because of its simplicity. The measure is also recommended in the manual of oral health survey at district level in Thailand (Department of Health, 1987). Therefore, this measure was selected to be employed in the present study to demonstrate the socio-dental approach of need estimation. However, the present orthodontic measure is only a crude indicator, particularly in comparison to other specific orthodontic index, such as the Occlusal Index (Summers, 1971), Indices of Treatment Need (IOTN) and Treatment Standard (Shaw et al, 1991 b).

Criteria for prosthetic treatment need for either dentures or crowns and bridges in population surveys are not universally established. The present study, therefore, tried to take into consideration the normative clinical judgements based on prognosis of abutments e.g. mobility, attachment loss, position or supporting structure and space ratio. Since the choice of making a bridge or partial denture is often subjective, it was decided to group this category as

prosthetic need.

9.3 Impact-Related Treatment Need

This study used the Oral Impacts on Daily Performances (OIDP) as the measure for perceived oral impacts of people for generating impact-related treatment need. The advantages of OIDP in this process have been fully described in Chapter 5. The major advantage in need estimation which should be stressed here is that the index focuses on measuring the endpoint of consequences of impact which makes the measure record only the significant impacts. This should be useful in the context of policy planning as they reflect disability and handicaps. Its single score is more convenient for decision making in planning compared to other multi-score indices. By using different cut-off points of scores, the administrators could set the level of significant impacts according to their circumstances and judgements. The cut-off points can be different for different kinds of treatment need. One of the major advantages of OIDP is that it can generate condition-specific scores (CS-OIDP) for the impacts of different treatment needs. As described and demonstrated in Chapter 7, CS-OIDP gives the planner clearer indications of treatment need appropriate to the impact.

However, there are some limitations of the OIDP in the present study relating to the criteria of CS-OIDP for each treatment need. The CS-OIDP relies on oral conditions possible related to the impacts (Table 4.1). The criteria were based on the past experience of researchers plus suggestions from experts, some of which are debatable. Since the oral examinations and the interviews

were independent in the present study, a particular oral condition and its perceived impact could not be precisely linked. Future investigations linking perceived impairment and normative treatment need is recommended.

The nature of perceived impacts of oral conditions were very different from clinical data (see Chapter 6). Many studies suggest that perceived impacts are subjective and related to psychosocial and environmental factors. Perceived impacts have a weak, sometimes significant association to clinical oral status (Reisine and Bailit, 1980; Cushing et al, 1986; Atchison and Dolan, 1990; Chen, 1991; Locker and Slade, 1994; Leao and Sheiham, 1995). The relationship was reflected in the relationship between Impact-Related Treatment Need in comparison with normative need. As expected, this resulted in a major changes in estimates of need. Normative treatment needs of conditions with low impact on people's daily lives were more reduced than treatment needs of conditions with higher oral impacts.

Three groups of dental treatment needs were found according to the rates of decline between normative to Impact-Related Treatment Need (Table 7.5). The first group, with the largest difference, was prosthetic and all periodontal treatments. The second group, with moderate differences, was fillings and the third group, with small differences, was pulp treatments and extractions. The findings are consistent with the results of previous studies in dentistry which indicated a wide discrepancy between perceived impacts, or awareness of lay people and professional clinical judgement, particularly in periodontitis, prosthetics and orthodontics. The perception of dental caries in people is relatively good (Bulman et al 1968, Ainamo, 1972) while self awareness of periodontal disease is poor (Bulman et al 1968, Ainamo, 1972, Cushing,

1986). In a study in a group of young adult males, there was a high and significant agreement in reporting carious teeth between subjects' perceptions and the oral examination (Ainamo, 1972). However, only 2% were aware of their gingivitis, while oral examination showed that 46% had gingival bleeding. In the national survey of the Thai population (Department of Health, 1995), while the awareness of related signs of tooth decay, such as black spot or hole in the teeth, within Thai adults was 21.4% and 40.4% respectively, awareness of periodontal conditions, such as bleeding or gingival abscess tended to be poorer; 12.4% and 13.6%. Smith and Sheiham (1980) found a poor relationship between perceived chewing ability and denture status in elderly people and felt need for treatment. It was only 42% of normative need. Kiyak (1982) reported that many elderly persons appear to perceive much less prosthetic treatment need than would be recommended by a dentist. Ettinger et al (1984) found that 60% of denture wearers who were considered in need for reline or replacement new dentures did not perceive the need. However, Fiske et al (1990) found in a group of elderly who sought dental care that their perceived need for prosthetics was greater than the normative need. There are also many studies showing that there are differences in individuals' responses to dental irregularities. The perception of malalignment of teeth does not always lead to dissatisfaction or perceived need for treatment (Shaw, 1981; Solomon et al, 1992; Tuominen and Tuominen; 1994).

The percent reduction of Impact-Related Treatment Need from normative treatment need in anterior teeth was less than posterior teeth, suggesting that psychological and social impacts from anterior teeth are higher than the more physical impacts from posterior teeth. Appearance is more important than

either function or health as a reason for taking care of teeth and gingiva in teenagers (Linn, 1966; Hawley and Holloway, 1992). Many studies of perceived need for tooth replacement also show that perceived need to replace anterior teeth was higher than posterior teeth (Ternovan and Knuuttila, 1988; Spratley, 1989; Schuurs et al, 1990).

Perceived impacts of dental problems always present in terms of awareness. Lack of awareness was said to be the major reason for low utilization of dental care, followed by suggestions for motivation of people's awareness through health education. In turn, dental professionals have to adjust their norm of judgement for oral diseases to a certain extent, to be compatible with the actual disease's impact on the real life of lay people.

Apart from the fact that the adults studied may not be an appropriate population to assess orthodontic treatment need, oral impacts relating to orthodontic treatment need in adolescents could also face another dilemma. As O'Brien (1996) pointed out at a conference on assessing oral health outcomes, perceived impact of malocclusion from children or young adolescents always relies heavily on parents' views and can be greatly changed when children become older. Thus, it was difficult to establish the impact-related need at this transitional age. Parent's expectation and the children's co-operation are important (Houston, 1990).

The degree of malocclusion justified by professionals, which is used as a criterion for case selection in orthodontic treatment need estimation, has some difficulties. The impact-related orthodontic treatment need of adults in this study showed that some subjects with a moderate to severe degree of

malocclusion reported having less impacts on daily activities than some with mild malocclusion. The percentage of Impact-Related Treatment Need compared to normative orthodontic treatment need for mild malocclusion (22.3%) is similar to the percentage of moderate to severe malocclusion group at CS-OIDP>0 (21.7%) (Table 7.5). In terms of planning with limited resources and in consideration of health gain from treatment, it could be decided to set the cut-off points of both normative and impact indicators at a higher level. For example, administrators might consider the justification of need for orthodontic treatment only in people who have at least a moderate degree of normative malocclusion and who also have high levels of perceived impacts from their malocclusions.

In treatment need, mainly for dental caries such as filling and pulp care, the long term progression of caries should be taken into account. As explained in Chapter 3, need considerations for caries may not take the impact dimensions into account. Nevertheless, where there are limited resources, normative impairment without impact might be considered a lower priority.

9.4 Effective Treatment Need

The investigation of Effective Treatment Need requires information about the effectiveness of existing dental treatments and required behavioural conditions from patients for an acceptable treatment prognosis. Unfortunately, both categories of information are not readily available because most dental treatments have not been adequately evaluated. Only a few randomized control trials, meta-analysis, decision analysis or cost-effectiveness studies for

dental treatment were found. Understanding the association between the prognosis of dental treatment outcomes and various behavioural and psycho-social variables is still underdeveloped. Under these restraints, the present study tried to explore, using periodontal disease as a case study, how propensity could be incorporated into Effective Treatment Need. Periodontal treatment is a clinical problem of interest from a cost-effectiveness and public health perspective because it is common, costly, and potentially controllable (Antczak-Bouckoms and Weinstein, 1987).

People with Effective Treatment Need (ETN) are those who have periodontal disease, perceive its impact on daily living and are likely to gain effective results from relevant treatment. In the study, a very low proportion of the population had Effective Treatment Need for periodontal treatment. Interestingly, the majority of people who had normative or Impact-Related Treatment Need for periodontal treatment did not have the acceptable level of behavioural propensity required for effectiveness of treatments. In other words, the majority of needy people for periodontal treatment would not gain from the treatment if their oral behaviour, which led to their diseases, were not improved. The low estimate of Effective Treatment Need was very different from the conventional normative need estimations. The change in the proportion in need is congruent with the changed recognition that a minor proportion of periodontal impairments are progressive or severe, have a relatively low impacts on daily living, and that those with more severe periodontal disease frequently do not have the required personal oral health behaviour to ensure the effectiveness of available treatments.

The discrepancies between Impact-Related and Effective Treatment Need

suggests the extent of need for health promotion to improve behavioural propensity of people who already have oral problems and suffer from their impacts. This is an essential part of need which is frequently ignored by traditional methods of assessing need for dental care and oral health. On the other hand, health promotion concentrating on a total population strategy (Rose, 1995) would benefit more people, requires different approaches to estimating need and setting goals. Planners should bear in mind that treatments of chronic conditions, such as caries and periodontal diseases, are highly dependent on prevention and health promotion. Short half-lives of fillings and relapse of periodontal disease are consequences of ignoring health promotion.

Therefore, it should be stressed that behavioural propensity, indicated by Effective Treatment Need, is mainly applied in the context of planning rather than individual screening. Effective Treatment Need is designed to disclose the proportion of people with Impact-Related Need who also have acceptable behavioural propensity to gain from dental treatment. With this additional information, the amount and priority of each treatment need would be better justified, particularly in parallel with resource allocation to health promotion. Though oral health behaviour of patients has been part of case selection in clinical practice, the criteria of behavioural propensity suggested here may not be fully applied for similar purposes at a clinical level. Indeed clinical application of behavioural propensity requires wider considerations and more flexibility of decision-making in each individual, partly due to ethical reasons.

The behavioural propensity measures for effective periodontal treatment need used in the case study were developed from the major behavioural-oriented

risk factors of periodontal destruction. Although the propensity factors, plaque and smoking, were selected primarily from a review of the literature, the result was confirmed by analysis within the study. The confirmation is considered useful, since many variables in previous studies were not collected using uniform criteria or under the same circumstances of analysis, such as in different age group, nationality, or study duration. Further development, including more psychosocial variables which have been associated with predictability in health/illness behaviour studies, such as intention, social network, self-efficacy, susceptibility to disease severity, perceived benefit of treatment, compliance, or the interaction among these variables in term of 'lifestyle' should be carried out. Investigating the linkages of these variables to behavioural propensity and then to effectiveness of various dental treatment needs, as well as demonstrating the usefulness in practical planning would require a lot of creativity.

9.5 Situation analysis of dental treatment needs in Ban Phang district

The estimated numbers of people aged 24-54 years in Ban Phang, who have normative, Impact-Related and Effective Treatment Need are presented in Table 7.11 and Table 8.4 . The numbers were estimated from extrapolation of 35-44 years data to encompass the more of adult population (25-54 years). These extrapolated numbers may not be valid due to the accuracy of underlying assumptions. However, this is only a crude estimate to give a rough indication of population in dental need in comparison to the actual amount of dental services within the district. This was illustrated by comparing needs from the present study with data from the National Oral

Health Survey (1995) and the dental service available. Ban Phang District, with only one dentist and one dental nurse in a community hospital, had a lower than average percentage of dental service than the average of the Region.

The comparison showed clearly that, apart from extractions, the normative estimation of treatment needs are around 3 to 20 times higher than the proportion of Regional people actually receiving dental treatments (Table 9.1). The data supported the criticism that need estimates drawn from normative needs data is inherently inaccurate and unrealistic. This kind of unrealistic difficulty seems to be common, as shown in many previous dental treatment need studies (Bawden and DeFreise, 1981; Dusadeepan, 1986; Manji and Sheiham, 1986, Kadir, 1992). Normative need for prosthetic treatment, in particular, showed the highest discrepancy, suggesting either incompetent or unrealistic normative estimations. Gordon (1991) criticised the existing need measures for removable denture that they mostly had low validity and reliability. He pointed out that factors beyond oral status, such as general health, discomfort, desire or perceived need of patients are also important for need estimation.

The Impact-Related Treatment Need estimated a smaller proportion of people needed dental care than normative need. They were considered to have higher priority than the normative need group. Balancing estimates with available resources, the administrator could have more and attainable alternative goals to set up for dental services. The information on people with normative need who suffered with a high impacts on their daily life (such as at CS-OIDP$\geq$10) would be the target for minimum level, of which dental services are to be

provided.

The estimated needs were compared to an actual dental services in Ban Phang (Table 9.2). The target for dental services are in two main groups. The schoolchildren had a full school dental health programme with free dental treatment. The broader objective for the general population is that they should receive services at dental clinics, integrated health promotion organized through sub-district health offices. The available dental services were limited to extractions, fillings and periodontal treatment, mainly scaling. As expected, the extent of treatment in Ban Phang was much lower than average service coverage of North-Eastern Region. Therefore, there were much larger differences between actual services and the estimated needs.

In consideration of the realistic recommendation to fulfill unmet needs in this district, the first step should be to focus on serving the basic minimum dental needs instead of looking at the large and unprioritized normative need. The basic minimum need could be tentatively set from available data as the Effective Treatment Need in periodontal treatment at cut-off level of CS-OIDP$\geq$10. Though this might look arbitrary, the administrator could explain the underlying reasons why this proportion of population was considered as really needy, such as, the effects on their daily living of people lacking services. Under the basic minimum assumption from available data, the services for periodontal treatment appears to be covered. However, more attention should be paid to achieving an acceptable required oral health behaviour in patients rather than on general simple scaling.

The possible longer term suggestions for the other dental treatment needs,

based on the assumption that the treatments are moderately effective within this population's propensity, are that additional services for restorative dentistry and a small amount of partial denture and endodontic services are needed at district level to cope with some highly impact-related needy people. While the more complicated and expensive treatments like fixed prostheses and orthodontic treatment would be considered beyond current resources. In comparison to regional or national statistics, this modest improvement should be attainable. More equity can be achieved by resource distribution. According to the National Survey in 1995, the percentage of people aged 35-44 years who received dental services in rural areas was only 38%, compared to 61% in urban areas and 67% in Bangkok. The dentist to population ratio of 1:41,000 in Ban Phang is also dramatically different from the ratio of approximately 1:3000 in Bangkok. The concept of accessible or comparative treatment need should be applied in this regard.

Table 9.1 Comparison of percentage of people aged 35-44 years who received dental services in North-Eastern Region of Thailand (NE-Thailand) and Normative, Impact-Related (IRTN) and Effective (ETN) Treatment Need in Ban Phang District

	% Treatment				
	Periodontal treatment*	Fillings	Endodontic treatment	Extractions	Prosthetic treatment
NE-Thailand	13.5	8.9	0.3	31.7	1.6
	Treatment need				
Ban Phang:					
Normative need	90.2	26.7	2.4	28.3	32.3
IRTN (CS-OIDP>0)	28.4	16.6	2.2	23.2	11.0
IRTN (CS-OIDP≥5)	12.0	11.6	1.4	15.8	4.2
IRTN (CS-OIDP≥10)	7.2	7.0	0.8	11.6	1.6
ETN (CS-OIDP>0)	6.4	+	+	+	+
ETN (CS-OIDP≥5)	2.0	+	+	+	+
ETN (CS-OIDP≥10)	1.2	+	+	+	+

* *Data from North-Eastern Thailand included all types of periodontal treatment, while data from Ban Phang referred to only treatment for periodontal destruction (CPITN 3,4)*

\+ *No estimate*

Table 9.2 Comparison of number of people[#] who received dental services in 1991-3 and Normative, Impact-Related (IRTN) and Effective (ETN) treatment need in Ban Phang district

	Number of persons				
	Periodontal treatment*	Filling	Endodontic treatment	Extractions	Prosthetic treatment
Adults receiving services in 1991	444	180	-	1,562	-
1992	242	116	-	896	-
1993	315	97	-	1,105	-
	Treatment need				
Ban Phang:					
Normative need	16,280	4,766	428	5,052	5,766
IRTN (CS-OIDP>0)	5,070	2,963	393	4,142	1,964
IRTN (CS-OIDP≥5)	2,243	2,071	250	2,820	750
IRTN (CS-OIDP≥10)	1,285	1,250	143	2,071	286
ETN (CS-OIDP>0)	1,140	+	+	+	+
ETN (CS-OIDP≥5)	357	+	+	+	+
ETN (CS-OIDP≥10)	214	+	+	+	+

\# *Children not included*

* *Data from North-Eastern Thailand included all types of periodontal treatment, while data from Ban Phang referred to only treatment for periodontal destruction (CPITN 3,4)*

\+ *No estimate*

9.6 The proposed theoretical model of dental treatment need

The features of the new approach

From the presentation and demonstration of the new approach of dental treatment needs in the present study, there are some crucial points that have to be stressed;

The socio-dental approach of dental treatment need is not intended to entirely replace the conventional treatment need. Indeed it compliments the normative need by providing subsets with assorted priorities within the conventional needs. These choices provide more alternatives for dental planning for various treatments. Additional analysis of Impact-Related, and Effective Treatment Need assists the planner by specifying the graded degree of priority groups, either within a particular treatment or between treatments. The theoretical explanations also emphasize different implications for different treatments, which deal with different types of oral conditions and impacts.

The proposed estimated need system is not the standard or *universal value* like the oral status measures, such as DMFT. As Liss and Nordenfelt (1990) concluded, 'the concept of need contains components which we cannot discover but have to choose.' Need is the *relative value*, subject to the circumstances within both population and service providers, such as health status, health and illness behaviour, cultural value of health, medical technology, health delivery system. Socio-dental need estimates can be varied according to different resource availability, the evaluation of results of treatment effectiveness, cultural value of teeth or oral health behaviour of

people in particular societies. As Coast et al (1996) concluded, needs assessment could, potentially, provide a means of setting priorities based on the relative need for different treatments. In this context, need must inevitably be seen as a relative concept.

The process of analysis by the socio-dental approach which had been demonstrated, is not a static procedure. It demonstrates an approach to assessing oral health needs. The system can be used flexibly for each type of treatment. The decision maker should provide appropriate reasons for the decisions. For example, the concept of Impact-Related Treatment Need does not rely solely on a definite cut-point for OIDP. The planner might prefer some qualification from other socio-dental indicators and manage to integrate it using similar concepts to generate Impact-Related Treatment Need. Evaluation of effectiveness of dental treatments and behavioural propensity are not static and are on-going processes. The changing state-of-art in either natural history of disease or effectiveness of treatment, would shape the practical approach of Effective Treatment Need estimations.

Lastly, even though this study of need is confined to treatment aspect of dental need, the final outcomes of the approach has implication beyond the purely clinical. The complete picture of need should cover a wider range of biopsychosocial factors. The broad strategy to satisfy needs will involve improving dental care access to the comparatively disadvantaged groups of people, health promotion to improve health behaviour of population, and then supply effective treatment to people according to their priorities.

The new approach and the changed value in contemporary health care

There has been a tension between many of the values underlying the biomedical model and those on which contemporary health care are based. The slowing in the rate of growth of resources in the health sector, which is a common feature across all countries, has resulted in realisation of the need for change in the values underlying both medicine and health care (Mooney and Jensen, 1990).

A system of health statistics should be based upon a conceptual framework that is broad enough to encompass all kinds of observation either disease, well-being, socio-psychological or environmental information (Wolfson, 1994). The present dental treatment need approach is an attempt to explore the practical solutions to the shortcomings of traditional normative need which were criticised and reviewed in Chapter 2. However, need inevitably involves values. Finally, we will deal with the intricate question of whose values should have a determining influence on the definition of health care need (Liss and Nordenfelt, 1990). Therefore, it would be useful to compare the changing values proposed in this approach to those in contemporary health care.

The socio-dental approach to dental treatment need included different levels of need which included broader values than solely professional judgement of disease model. The well-being or quality of life of people is taken into account in Impact-Related Treatment Need. The level of need reflects the recent changing value in modern medicine and health care from 'paternalism' to 'autonomy' (Jensen and Mooney, 1990). Paternalism values the role of the expert as the key factor in health care. While autonomy respects differences

in human values. In addition, the contemporary scientific definition of disease has been presented by Boorse (1977) that "A disease is a type of internal state which is either an impairment of normal functional ability, i.e. a reduction of one or more functional abilities below typical efficiency, or a limitation on functional ability caused by environmental agents". Eliminating disease is, according to this definition, related to human cultural standards of functioning. Wolfson (1994) suggested that imbalance between disease and health information and the lack of coherence in health information system must be countered by an outcome-oriented population perspective, common concepts and definitions, and an appropriate mathematical structure. Inclusion of a socio-dental measure is a way to bring subjective responses from people into need systems. This should improve the autonomy dimension in health care as well as balance the information on disease and well-being of people in a numeric form.

The growing insight about the importance of lifestyles for disease patterns has also resulted in an awareness of the individual's responsibility for his or her own health (Jensen and Mooney, 1990). The Alma-Ata Declaration (WHO, 1978 b) is a landmark in the history of health care and health education. It was stated that people not only have a right to participate in the planning of health care, but also have a duty to do so. The third level of socio-dental need, Effective Treatment Need, considered a certain level of people's health behaviour for effectiveness of treatment results. This consideration could be considered as either required responsibility from people, or part of need for health promotion.

Furthermore, the final level of need is related to another type of autonomy,

social autonomy. It is a well known that many kinds of weaknesses and dependence are due to the way of organising society and to environmental and working conditions. Paradoxically, health care access appears to vary inversely with need (Doyal and Gough, 1991). Studies linking epidemiological data with sociobehavioural data suggest that regularity of dental visits is not related to actual occurrence of disease. Individuals who regularly visit a dentist have more teeth, lower amounts of untreated caries, and higher numbers of restored teeth (Petersen and Holst, 1995). This kind of phenomenon cannot be changed by individuals, but require a responsibility of society (Jensen and Mooney, 1990). Taking actions that reduces inequality in health is not only important as a social goal, but without reductions in socioeconomic differences in health, the ability to meet health targets for the whole society will be reduced (Marmot, 1994). This principle is embodied in the WHO 's Health for All by the year 2000 (WHO, 1983), endorsed by many governments all over the world, aiming to secure justice or equity in health care. To address that concept, Accessible Treatment Need in the proposed approach includes similar concepts of 'comparative need' (Bradshaw, 1972) into dental treatment need.

The contribution of the new approach to the current knowledge of dental public health planning

The traditional disease-oriented or bio-medical approach to assess dental treatment needs has been criticized for its shortcomings during the past to decades. However, there is no practical alternative approach for dental treatment need assessment. Even though the extent of socio-dental studies

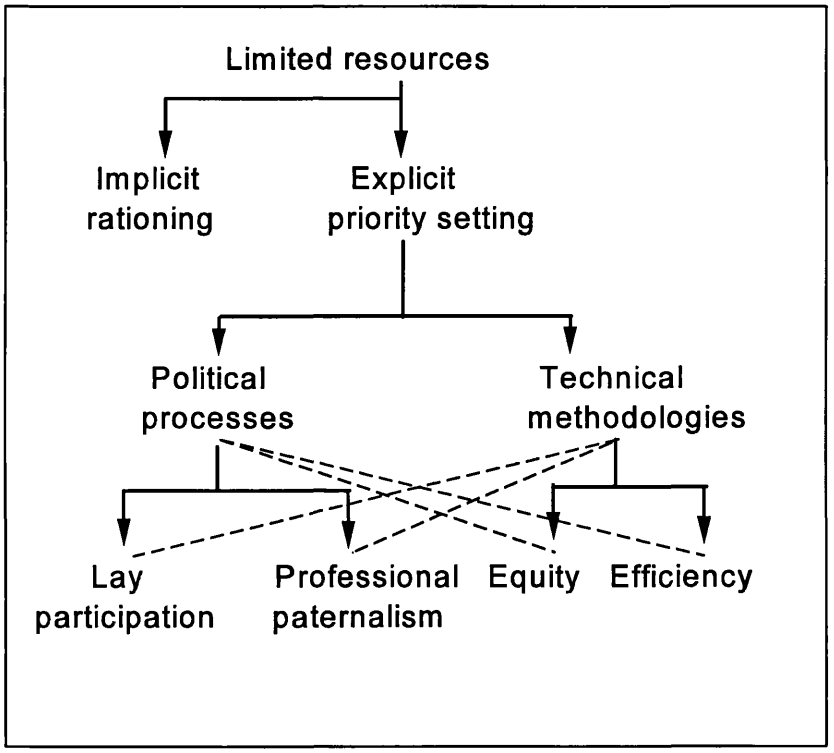
has been considerably developed, the linkage of the concept to dental treatment need assessment is scarce. The recent guideline for assessing oral health needs in the USA recommended by the Association of State and Territorial Dental Directors (1995) still focuses on measuring oral health status as an indication for need of treatment services.

The proposed approach to dental treatment need attempts to extend the scope of dental treatment need to cover the contemporary concept of health, which would also resolve the shortcomings of traditional treatment need assessment (see Chapter 2). The present approach provides the multi-dimensional levels of dental treatment needs, including the broader aspects of perceived oral impacts from lay people, behavioural propensity for health gain from dental treatments and environmental factors of dental treatment utilization. These multi-level choices of dental treatment needs provide wider information for priority setting in dental care planning. In addition, under the concept of Impact-Related Treatment Need, it is possible to prioritize dental treatment need in relation to other medical treatments. The difficulty of this application is the selection of a proper quality of life measure with the acceptable coverage of dimensions to reflect various disorders (see Chapter 2, section 2.2).

However, in reality, this technical approach has to be balanced with other aspects of decision making processes. From the current health care debate, there are two distinguished means of developing priorities: technical methodologies versus political bargaining process. It would be unrealistic to expect to apply technical methods, such as this socio-dental approach, to priority setting at all levels of health care. It would be too complex and too

costly. There are, however, real dangers with political bargaining in that not only does it not provide a basis against which to judge the chosen priorities, but it also ignores the knowledge and information available (Coast, 1996). Within the technical methodologies, equity and efficiency provide the basis of the model, as well as the consideration of both views of professional and lay people (Figure 9.1).

Figure 9.1 A structure for priority setting



Source: Coast J et al (eds) : Priority setting: The health care debate. 1996: Wiley & Sons, Chichester.

Under this model of health care planning, the proposed dental treatment need approach, which comprises integrated factors related to equity and effectiveness of treatment from the perspective of professional and lay people, should provide a useful guide for dental care planning.

9.7 Summary and conclusions

To improve the restricted traditional approach of dental treatment need estimation, a new theoretical model of treatment needs composed of 'Normative', 'Impact-Related', 'Effective' and 'Accessible' Treatment Needs, is proposed. A concise indicator 'Oral Impacts on Daily Performances' (OIDP) was developed, based on measuring impacts on eight physical, psychological and social aspects of daily activities.

The main conclusion from the research is that:

- The indicator 'Oral Impacts on Daily Performances' (OIDP) was tested as a valid and reliable indicator of oral outcomes. The process of integrating the OIDP into normative need to generate 'Impact- Related Treatment Need' and exploratory procedures in developing 'Effective Treatment Need' was demonstrated. The new approach can improve dental treatment need estimations by modifying the extent of normative need, primarily by reducing the need for oral conditions with low impact on daily living and with low effectiveness treatment in people who had a low behavioural propensity.

In addition to the main conclusion, summary and conclusions based on the findings are made according to the four objectives of the present study:

Objective 1

To develop a socio-dental indicator to measure perceived oral impacts with the suitable qualification for the integrating process and to test its

psychometric properties.

- A new composite socio-dental indicator which measures the outcomes of oral conditions was developed to facilitate the socio-dental approach in dental treatment need planning. The indicator, Oral Impacts on Daily Performances (OIDP), was designed to be a concise measure with a final single score, focusing on measuring the endpoint outcomes of oral conditions on daily livings. Nine physical, psychological and social aspects of daily activities representing major variables from various social indicators were chosen for their content validity. Scores were calculated by multiplying the frequency by the severity scores of each performance. Then scores for all performances were summated. To increase the usefulness of the OIDP for assessing specific treatment needs, questions were asked about the perceived causal symptoms and impairments of any impact on performance.

- The indicator was piloted and then tested in the study population. This low caries people had as high an incidence of oral impacts as industrialized, high dental disease populations. 73.6% of all subjects had at least one daily performance affected by an oral impact. The highest incidence of performances affected were Eating (49.7%), Emotional stability (46.5%) and Smiling (26.1%). Frequency and severity presented the paradoxical effect on different performances and should both be taken into account for overall estimation of impacts. Eating, Emotional stability and Cleaning teeth performances had a high frequency or long duration of impacts, but a low severity. The low frequency performances; Physical activities, Major role activity and Sleeping were rated as high severity. Pain and discomfort were mainly perceived as the causes of impacts (40.1%) for almost every

performance except Smiling. Toothache was the major causal oral condition (32.7%) of almost all aspects of performance.

- The OIDP score was tested for reliability and validity. One of the performance measures, Physical activities, was considered to be redundant and excluded, so the final version of OIDP consists of eight daily performances. It was concluded that the OIDP is a valid and reliable alternative indicator of oral outcomes which has potential to be appropriately used in the study population for dental care planning and evaluation of outcomes.

Objective 2

2.6.2 To collect data on oral health status, normative treatment need, the perceived impact of oral conditions, and the health and illness behaviour on a group of 35-44 year-old rural Thais.

- 79.8% of sample of 35-44 year old rural Thais had 28 sound teeth or more. Only 1.6% had less than 20 sound teeth. 27.7% of the sample were caries free. The mean DMFT was only 2.7 (sd 3.1) of which 1.6 were missing teeth and only 0.03 were filled. 21.5% and 90.2% had deep and shallow periodontal pockets respectively. Protheses wearing was found very rare (1.4%).

- Normative treatment needs were generally high for periodontal treatments: 98.4%, 69.8% and 21.4% in scaling, root planing and deep pockets treatment respectively. Need for prostheses was found in one-third of the

samples. Need for extraction, filling and pulp treatment were 28.3%, 26.7% and 2.4% respectively. Orthodontic need for moderate to severe malocclusion was 12%.

- 62.1% of subjects brushed their teeth twice daily. 21.4 % were current smokers. Dental service utilization of the sample was generally very low. 57.9% reported never visiting a dentists in their lives. Only one fourth had their last dental visit during the past two years.

Objective 3

To generate the dental treatment need which included perceived oral impacts from people with clinical judgements and compare this kind of treatment need, namely "Impact-Related Treatment Need", to the normative treatment need in the study population.

- The part of causal impairment in the OIDP measure was used to established the Condition-Specific OIDP scores (CS-OIDP), which is the impact score from only a relevant causal impairment of a specific assessed treatment need. The combination of normative needs and CS-OIDP scores generated the Impact-Related Treatment Need for various dental treatments.

- As expected, the percentage of people with need was decreased from normative need, when Impact-Related Treatment Need was applied. The differences were large in needs for prostheses, orthodontics and periodontal treatment (ranging from 21.7% to 40.2% of normative need); moderate for restorations (64%); and low for pulp care and extractions (81.7%-91.7%).

A similar pattern of need reduction was obtained when increasing cut-off points of CS-OIDP scores.

- The Impact-Related Treatment Need has a major advantage in planning dental services by reducing high normative treatment needs in proportion to the extent of their impacts on daily living. In comparison among different dental treatments, ranking of percentages of people who need treatments changed. Ranking of needs for scaling, root planing, prostheses and orthodontics decreased steadily when CS-OIDP scores using cut-off points 0, 5, 10, were integrated. While ranking of needs for extraction, filling, treatment for deep periodontal pockets and pulp care were increased. The revised treatment needs were more realistic for dental care planning when compared to the actual services in the district and North-Eastern Region of Thailand.

Objective 4

To explore the preliminary approach to assess the behavioural propensity of periodontal treatment and integrate it into the "Impact-Related Treatment Need" for periodontal treatment.

- The appropriate behavioural propensity for effective periodontal treatment need was defined from the association between periodontal conditions and behavioural-related risk factors in the study population, in combination to that found in the available literature. The people who were non-smokers with plaque indices of 0.80 or lower was appropriate to be defined as having acceptable behavioural propensity for periodontal treatment. These criteria were used in an integrating process to generate the exploratory

effective periodontal treatment need in the study population.

- Simple scaling or oral prophylaxis for subjects without periodontal destruction was excluded from the estimation of need at the Effective Treatment Need level due to the consideration of effectiveness. The percentage of people considered as having Effective Periodontal Treatment Need for root planing decreased to under 10% in comparison to normative need. The majority of people who had normative, or Impact-Related Need for periodontal treatment, were unlikely to gain from treatment if their oral behaviours were not improved.

9.8 Suggestions for further research

Extension of similar studies to cover groups with wider ranges of age, socio-economic status, oral disease levels and differing culture are recommended.

In terms of theoretical content, Effective and Accessible Treatment Need, requires further exploration. The effectiveness and behavioural propensity of other dental treatments should be evaluated to generate the practical approach to Effective Treatment Need assessment. The study of Accessible Treatment Need demands more involvement of community-based information of environmental factors, such as, accessibility of dental services, cost and other barriers of dental treatment utilization.

The indicator, Oral Impact on Daily Performance (OIDP) has been used in various studies, such as, the National Diet and Nutrition Survey in persons 65

years and older in England (Department of Health, Ministry of Agriculture, Fisheries and Food, 1995), the study of dental treatment needs in East London adults (Robinson et al, 1996), the comparative study of dental treatment need in Greece (Tsakos. 1995), the study of dental treatment need in Thai elderly people (Srisilapanan, 1995), the study of impacts from oral trauma in Brazilian schoolchildren (Cortes, 1994). The comparison of oral impacts among those studies should be encouraged to enhance cross-cultural understanding of impacts. Furthermore, a follow-up study in Ban Phang should test the sensitivity to change of the indicator. Meanwhile a study of relationship between perceived oral impairments and normative treatment needs, which was discussed in Section 9.3, should be carried out to improve the validity of CS-OIDP score.

Lastly, at an intervention level, the application of the system of assessing needs suggested here and evaluating the outcomes of treatments provided in light of that system should be tested in field studies. For example, further research in Ban Phang to look at changes of various needs between sub-districts in which dental treatments are experimentally planned and implemented and the control sub-district, would enhance the understanding of the interaction of theoretical variables in the field situation.

REFERENCES

REFERENCES

Abramson JH (1974) : Survey methods in community medicine. Churchill-Livingston, London.

Acheson RM (1978) : The definition and identification of need for health care. *J Epidemiol Community Health* 32:10-5.

Aday LA and Forthofer RN (1992): A profile of black and Hispanic subgroups' access to dental care: findings from the National Health Interview Survey. *J Public Health Dent* 52(4): 210-5.

Ah MK, Johnson GK and Kaldahl WB (1994) : The effect of smoking on the response to periodontal therapy. *J Clin Periodontol* 21:91-7.

Ainamo J, Sarkki L, Kuhalampi ML, Palalampi L and Piirto O (1984) : The frequency of periodontal extractions in Finland. *Community Dent Health* 1: 165-72.

Ainamo J (1972) : Awareness of the presence of dental caries and gingival inflammation in young adult males. *Acta Odont Scand* 30: 615-9.

Ajzen I (1985) : From intention to actions: a theory of planned behaviour. In Kuhl J and Beckmann J : Action control from cognition to behaviour. Springer, Heidelberg.

Ajzen I and Fishbein M (1980) : Understanding attitudes and predicting social behaviour. Prentice-Hall. New Jersey.

Ajzen I and Fishbein M (1977) : Attitude-behaviour relations: a Theoretical analysis and review of empirical research. *Psychological Bulletin* 84: 888-918.

Altman DG (1991) : Practical statistics for medical research. Chapman and Hall, London.

Alexander AG (1970) : The relationship between tobacco smoking calculus and plaque accumulation and gingivitis. *Dent Health* 9: 6-12.

Anaise JZ and Mann J (1982) : Prevalence of dental caries and demands for services among Israeli kibbutz youth. *Community Dent Oral Epidemiol* 10: 161-2.

Anderson K and Newman J (1973) : Societal and individual determinants of medical care utilization in the US, Millbank Memorial Fund Quartery. 51: 95-124.

Anastasi A (1982): Psychological testing, 5th edn, London, Collier Macmillan Publishers.

Andrews FM (1981) : Social indicators and health for all. *Soc Sci Med* 15C, 19-3.

Antczak-Bouckoms A (1994) : Natural history of periodontitis and a review of technologies to prevent and treat it. *J Dentl Educ* 58(8) 625-40.

Antczak-Bouckoms A, Joshipura K, Burdick E and Tulloch JFC (1993) : Meta-analysis of surgical versus non-surgical methods of treatment for periodontal disease. *J Clin Periodontal.* 20: 259-68.

Antczak-Bouckoms AA and Weinstein MC (1987) : Cost-effectiveness analysis of periodontal disease control. *J Dent Res* 66:1630-5.

Arnö A, Waerhaug J, Lövdal A, and Schei O (1958) : Incidence of gingivitis as related to sex, occupation, tobacco consumption, tooth-brushing and age. *Oral Surg Oral Med Oral Pathol* 11: 587-95.

Atchison K and Dolan T (1990) : Development of the geriatric oral health index. *J Dent Educ* 54:680-7.

Bader J and Shugars D (1993) : Agreement among dentists' recommendations for restorative treatment. *J Dent Res* 72: 891-6.

Bader J and Shugars D (1995) : Variation in dentists' clinical decisions. *J Public Health Dent* 55(3): 181-8.

Bailit HL, Braun R, Maryniuk GA and Camp P (1987) : Is periodontal disease the primary cause of tooth extraction in adults? *J Am Dent Assoc* 114: 40-5.

Bailit H, Raskin M, Reisine S and Chiriboga D (1979) : Controlling the cost of dental care. *Am J Public Health.* 69: 699-703.

Barenthin I (1977) : Dental health status and dental satisfaction. *Int Dent J* 32: 281.

Barmes DE (1990) In Elderton RJ (ed) : Evolution in dental care. Clinical Press Limited, Bristol.

Barmes DE (1975) : Current systems of delivery of oral health services. *Int Dent J* 25:20.

Bastian RJ and Waite IM (1978) : Effects of tobacco smoking on plaque development and gingivitis. *J Periodontol* 49: 480-9.

Bateman PM (1985) : Understanding and predicting tooth brushing behaviour in adolescents. MSc. Report. London Hospital Medical College, London.

Bates JF (1986) : Partial denture; General principles of treatment. In Rowe AHR, Alexander AG and Johns RB (eds) : Clinical dentistry (vol.3). Blackwell Scientific Publications, London.

Bawden JW and DeFreise GH (1981) : Planning for dental care on a statewide basis. The Dental Foundation of North Carolina, Chapel Hill, North Carolina.

Beck JD (1968) : Dental health status of the New Zealand population in the late adolescence and young adulthood; a survey conducted by the Dental Health Division of the Department of Health. Department of Health, Special report series N.29. Wellington.

Beck JD, Koch GG, Rozier RG and Tudor GE (1990) : Prevalence and risk indicators for periodontal attachment loss in the population of older community-dwelling blacks and whites. *J Periodontol Res* 61: 521-8.

Becker M (ed) (1974) : The health belief model and personal health behaviour. *Health Educ M onograph* 2: 1-146.

Becker MH and Maiman LA (1975) : Socio-behavioural determinants of compliance with health and medical care recommendations. *Med Care* 13:10.

Bellini HT (1974) : The time factor in periodontal therapy; a pilot study correlating time and plaque, calculus, pocket depth and number of teeth. *J Periodont Res* 9: 56-61.

Bernger M and Bobbitt B (1981) : The sick role impact profile: development and final revision of a health status measure. *Med Care* 19: 787-805.

Bergner M, Bobbitt RA, Kressel S, Pollard WE, Gilson BS and Morris JR (1976) : Sickness impact profile: Conceptual formulation and methodology of the development of a health status measure. *Int J Health Serv* 6, 393-415.

Bergström J, Eliasson S and Preber H (1991) : Cigarette smoking and periodontal bone loss. *J Periodontol* 62(4): 242-6.

Bergström J (1989) : Cigarette smoking as risk factor in chronic periodontal disease. *Community Dent Oral Epidemiol* 17: 245-7.

Bergström J and Eliasson S (1987) : Cigarette smoking and alveolar bone height in subjects with a high standard of oral hygiene. *J Clin Periodontol* 14:466-9.

Bergström J and Henrikson (1974) : Quantitative long-term determinations of the alveolar bone mineral mass in man by I^{125} absorptiometry (II) following periodontal surgery. *Acta Radiologica. Therapy Physics Biology* 13: 489-500.

Bice TW (1976) : Comments on health indicators: methodological perspectives. International Journal of Health Services. 6(3): 509-19.

Birch S (1988) : The identification of supplier inducement in a fixed price system of health care provision. *J Health Econ* 7: 129-50.

Blaxter M (1990) : Health and life-styles. Routledge, London.

Bloom SW and Wilson RN (1972) : Patient-Practitioner relationships. In Freeman HE et al. (eds.) : Handbook of medical sociology. 2nd ed. Prentice-Hall, Englewood Cliffs, N.J.

Boorse C (1977) : Health as a theoretical concept. *Philosophy of Science* 44: 542-73.

Bowling A (1996): The effects of illness on quality of life: findings from a survey of households in Great Britain. *J Epidemiol Community Health* 50: 149-55.

Bowling A (1995): Measuring disease. Open University Press, Buckingham.

Bradburn NM and Miles C (1979) : Vague quantifiers. *Public Opinion* Q 43: 92-101.

Bradshaw JS (1972) : A taxonomy of social need. In McLachlan G (ed) : Problems and progress in medical care: essays on current research. 7th series edition. Oxford University Press, Oxford.

Brazier JE, Harper R, Jones NMB, O'Cathain A, Thomas KJ, Usherwood T and Westlake L (1992) : Validating the SF-36 health survey questionnaire: new outcome measure for primary care. *Bri Med J* 305: 160-4.

Bronkhorst E.M., Truin G.J., Batchelor P. and Sheiham A. (1991) : Health through oral health ; Guideline for planning and monitoring for oral health care : A critical comment on the WHO model. *J Public Health Dent* 51 (4):223-7.

Broughton A.M. and Smales R.J. (1991) : Comparison of dental needs with the treatments actually received. *Aust Dental J* 36(3): 223-30.

Brown LJ and Löe H (1993) : Prevalence, extent, severity and progression of periodontal diseases. *Periodontology 2000* 2: 57-71.

Brown LJ, Oliver RC and Löe H (1989) : Periodontal diseases in the US in 1981: prevalence, severity, extent, and role in tooth mortality. *J Periodontol* 60:363-70.

Buckley LA and Crawley MJ (1991) : A longitudinal study of untreated periodontal disease. *J Clin Periodontol* 11: 523-30.

Bulman JS, Richards ND, Slack GL and Willcocks AJ (1968) : Demand and need for dental care; a socio-dental study. Oxford University Press, London.

Burt BA (1988) : Public health implications of recent research in periodontal diseases. *J Public Health Dent* 48(4): 252-6.

Burt BA, Ismail AI and Eklund SA (1985) : Periodontal disease, tooth loss and oral hygiene among older Americans. *Community Dent Oral Epidemiol* 13:93-6.

Campbell AV (1977) : Establishing ethical priorities in medicine. *Br Med J*, 1:818-21.

Capilouto E (1991) : Access to appropriate dental care. Curr Opin Dent 1(3): 316-21.

Carr W and Wolfe S (1979) : Unmet needs as a socio-medical indicators. In Elinson J and Siegman AE (eds) : Socio-medical health indicators. Baywood publishing Co., Faringdale, pp.33-46.

Cahen PM, Frank RM and Turlot JC (1985) : A survey of the reasons for dental extraction in France. *J Dent Res* 64: 1087-93.

Chen MK and Bryant BE (1975). The measurement of health - a critical and selective overview. *Int J Epidemiol* 4:257-64.

Chen MK and Lowenstein F (1984) : Masticatory handicap, socioeconomic status, and chronic conditions among adults. *J Am Dent Assoc* 109: 916-8.

Cherry-Pepper G, Sinkford JC, Newman ES, Sanders CF and Knight RS (1995) : Primary oral health care in black Americans: an assessment of current status and future needs. *J Natl Med Assoc* 87(2): 136-40.

Chisck MC (1995) : Comparing dental utilization of US Army soldiers with their employed civilian cohorts. *Community Dent Oral Epidemiol* 23(4): 222-5.

Claffey N, Nylund K, Kiger R, Garret S and Egelberg J (1990) : Diagnostic predictability of scores of plaque, bleeding, suppuration and probing depth for probing attachment loss: 3 1/2 years of observation following initial periodontal therapy. *J Clin Periodontol* 17: 108-14.

Clark WB and Löe H (1993) : Mechanisms of initiation and progression of periodontal disease. *Periodontology 2000*, 2: 72-82.

Coast J, Bevan G and Frankel S (1996) : An equitable basis for priority setting? In Coast J, Donovan J and Frankel S (eds) : Priority setting: The health care debate. John Wiley & Sons, Chichester, pp 142-263.

Cochrane AL (1972) : Effectiveness and efficiency. The Nuffield Provincial Hospitals Trusts, London.

Cochrane AL (1976) In Acheson RM, Hall DJ and Aird LA (eds) : Health information, planning, and monitoring. Oxford University Press, Oxford.

Cohen L and Jago J (1976) : Toward the formulation of socio-dental indicators. *Int J Health Serv* 6:681-98.

Conrad D, Milgrom P and Kiyak A (1984) : Insurance plan effects on dental provider treatment for elderly patients. *Med Care* 22: 430-46.

Cooper MH (1975) : Rationing health care. Chrome Helm. London.

Cortes MIDS (1994) : Relationship of prevalence of dental trauma to psychosocial problems in school children of Belo Horizonte, Brazil. PhD protocol. Department of Epidemiology and Public Health, University College London.

Cox DR (1957) : A note on grouping. *J Am Statist Assoc* 52: 543-7.

Cox DR, Fitzpatrick R, Fletcher AE, Gore SM, Spiegelhalter DJ and Jones DR (1992) : Quality of life Assessment: Can we keep it simple? *J R Statist Soc A* 155 (3): 353-93 .

Cronbach LJ (1951) : Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 297-334.

Culyer AJ (1983)(ed) : Health Indicators: an international study for the European Science Foundation. Robertson, Oxford.

Cummings KM, Becker MH and Maile MC (1980) : Bringing the models together: an empirical approach to combining variables used to explain health actions. *J Health Behaviour Med* 3:123-45.

Cushing AM, Sheiham A and Maizels J (1986) : Developing socio-dental indicators-the social impact of dental disease. *Community Dental Health* 3:3-17.

Davies GN, Horowitz HS and Wada W (1973) : The assessment of dental caries for public health purposes. *Community Dent Oral Epidemiol* 1: 68-73.

Davies GN, Horowitz HS and Wada W (1974) : The assessment of periodontal disease for public health purposes. *J Periodont Res* 9: 62-70.

Davies GN, Kruger BJ and Homan BT (1969) : Dental survey of children in country districts of Queensland. *Aust J Dent* 14: 153-61.

Davis P (1980) : The social context of dentistry. Croom Helm Ltd. London.

Davis P (1987) : Introduction to the sociology of dentistry: a comparative study. University of Otago Press, Dunedin.

Dental Health Division (1987) : Manual of oral health survey for local planning. Ministry of Public Health, Thailand. *(Thai)*

Department of Health, Ministry of Agriculture, Fisheries and Food (1995) : National Diet and Nutrition Survey: People aged 65 and over : Dental survey. Ministry of Agriculture, Fisheries and Food, London.

Department of Health and Social Security (1989) : Caring for people. London.

Dolan TA and Atchison KA (1993) : Implications of access, utilization and need for oral health care by the non-industrialized and institutionalized elderly on the dental care delivery system. *J Dent Educ* 57(12): 876-87.

Donabedian A (1974) : Aspects of medical care administration. Harward University Press, Cambridge.

Doyal L and Gough I (1991): A theory of human need. MacMillan Education LTD, London, pp 11.

Dusadeepan A (1986) : An investigation into the feasibility of improving periodontal health in Thailand using different approaches and varying types and numbers of health personnel. M Sc Report. University College London.

Ebel RL (1951) : Estimation of the reliability of ratings. *Psychmetrica* 16:407-24.

Elderton RJ (1993) : Overtreatment with restorative dentistry: when to intervene ? *Int Dent J* 43: 17-24.

Elderton RJ and Nuttal NM (1983) : Variation among dentists in planning treatment. *Br Dent J* 154:201-6.

Elias AC (1996) : The relationship between number, position and condition of teeth and satisfaction with mouth: Studies in Brazilian adults. PhD Thesis, University of London.

Elinson J (1976) : Introduction to the theme: sociomedical health indicators. Int-J-Health-Serv. 6(3): 385-91.

Ettinger RL (1984) : Clinical decision making in dental treatment of the elderly. *Gerodontology* 3: 157-65.

Ettinger RL, Beck and Jakobson. (1984) : Removable prosthodontic treatment needs: a survey. *J Prosthet Dent* 51(3): 419-27.

Engel GL (1980) : The clinical application of the biopsychosocial model. *Am J Psychiatry* 137: 535-44.

Feldman RS, Bravacos JS and Rose CL (1983) : Association between smoking different tobacco products and periodontal disease indexes. *J Periodontol* 54: 481-90.

Feldman RS, Kapur K, Alman JE and Chauncey HH (1980) : Aging and mastication: Changes in performance and in the swallowing threshold with natural dentition. *J Am Geriatric Soc* 3:97.

Fiske J, Gelbier S and Watson RM (1990) : The benefit of dental care to an elderly population assessed using a sociodental measure of oral handicap. *Br Dent J* 24: 153-6.

Fitzpatrick R (1990) : Measurement of patient satisfaction. In Hopkins A.& Costain D.(eds): Measuring the outcomes of medical care. The Royal College of Physicians of London, London.

Fletcher RH, Fletcher SW, Wagner EH (eds) (1988) : Clinical Epidemiology, the Essentials. 2nd ed. Williams and Wilkins, Baltimore.

Frankel S and West R (1993) : Rationing and rationality in the National Health Service: The persistence of waiting lists. MacMillan, Basingstoke.

Fransen A (1984) (ed) : Public health aspects of periodontal disease: Proceeding of a workshop in Copenhagen. Quintessense Publishing, London.

Freeman R (1984) : Understanding and predicting sugar consumption in adolescents: factors affecting choice intention. Msc report, London Hospital Medical College, London.

Friedson E (1970) : Profession of medicine. Mead, New York.

Fushs VR (1972) : The contribution of health services in the American economy. In Fushs V.R. (ed) : Essays on the economics of health and medical care. Columbia University Press. New York.

Gelbier S and Hopes I (1979) : The dental needs of day-patients and in-patients at London Hospital (geriatric unit). *Publ Health* 93: 350-7.

Genco RJ and Löe H (1993) : The role of systemic conditions and disorders in periodontal disease. *Periodontology 2000* 2: 98-116.

Giddon DB, Moser M, Colton T and Bulman J (1976) : Qualitative relationships between perceived and objective need for health care-Dentistry as a model. *Public Health Reports* 91: 508-13.

Gift HC (1984) : Utilization of professional dental services. In Cohen L.K. & Bryant P.S.(eds) : Social sciences and dentistry; a critical bibliography. Vol.2. Quintessence Pub Co Ltd. London.

Gift HC and Redford M (1992) : Oral health and the quality of life. *Clin Geriatric Med* 8(3): 673-83.

Gjermo P (1976) : The assessment of needs for periodontal treatment. *Int Dent J* 26: 41-5.

Glass N (1976) : In Archeson RM, Hall DJ and Aird LA : Health information, planning and monitoring. Oxford University Press. Oxford.

Goldstein IL, Mobley WH and Chelini SJ (1971) : The observer process in the visual interpretation of radiographs. *J Dent Educ* 35:485-91.

Gooch BF, Dolan TA and Bourque LB (1989) : Correlates of self-reported dental health status upon enrollment in the Rand Health Insurance Experiment. *J Dent Educ* 53 (11): 629-37.

Goodman HS and Weyant RJ (1990) : Dental health personnel planning: a review of the literature. *J Public Health Dent* 50 (1): 48-63.

Gordis L (1979) : Assuring the quality of questionnaire data in Epidemiological research. *Am J Epidemiol* 109(1): 21-4.

Gordon SR (1991) : Measurement of oral status and treatment need among subjects with dental prostheses: Are the measures less reliable than the prostheses? Part II: Treatment need in removable prosthodontics. *J Prosthet Dent* 65:801-3.

Gray J (1983): Classical liberalism, positional goals and the politicisation of poverty. In Ellis A and Kumar K (eds), Dilemmas of Liberal Democracies, Tavistock, London, pp 182.

Green LW and Johnson KW (1983) : Health education and health. In Mechanic D (ed) : Health care and the health professions. Coller Macmillan. London. pp.744-65.

Green L, Kreuter MW, Deeds SG and Partridge KB (1980) : Health education planning. A diagnostic approach. Mayfield Publishing Company, California.

Greene JC and Vermillion JR (1964) : The Simplified Oral Hygiene Index. *J Am Dent Assoc* 68: 25-31.

Grembowski D and Milgrom P (1988): The influence of dentist supply on the relationship between fluoridation and restorative care among children. *Med Care* 26, 907-17.

Grembowski D, Conrad D, Weaver M and Milgrom P (1988): The structure and function of dental care markets. A review and agenda for research. *Med Care* 26, 132-47.

Grondahl HG (1979) : Decision strategies in radiographic caries diagnosis. *Swed Dent J* 3: 173-80.

Grytten J (1991) : The effect of the price of dental services on their demand and utilisation in Norway. *Community Dent Health* 8(4): 303-10.

Grytten J (1992) : Supplier inducement- its relative effect demand and utilisation. *Community Dent Oral Epidemiol* 20(1): 6-9.

Guyatt GH, Bombardier C and Tugwell P (1986) : Measuring disease specific quality of life in clinical trials. *Can Med Assoc J* 134: 919-23.

Hall J, Masters G, Tarlo K and Andrews G (1984) : Measuring outcomes of health services. Department of Community Medicine, Westmead Centre, Westmead.

Hannay D (1980) : The iceberg of illness and trivial consultations. *J Royal College Gen Pract* 30: 551-4.

Harman W (1974) : The new Copernican revolution. In Lee P, Ornstein RE, Galin D et al. (eds) : Can consciousness make a difference ? Symposium on consciousness of the American Association for the Advancement of Science. Viking Press, New York. pp. 1-18.

Harris AI (1971) : Handicapped and impaired in Great Britain, Appendix D. HMSO, London.

Hawley GM and Holloway PJ (1992) : Factors affecting dental attendance among school leavers and young workers in Greater Manchester. *Community Dent Health* 9: 283-7.

Haynes R.B. (1979) : Determinants of compliance: the disease and the mechanics of treatment. In Haynes R.B., Taylor DW and Sackett DL (eds) : Compliance in health care. The Johns Hopkins University Press, Baltimore.

Hazelkorn H (1985) : A comparison of dental treatment plans under different reimbursement systems. *J Public Health Policy* 6:223-35.

Heller A. (1974) : The theory of need in Marx. Allison and Busby Ltd, London.

Helm S, Kreiborg S, Solow B (1985) : Psychosocial implications of malocclusion: A 15-year follow up study in 30-year-old Danes. *Am J Orthodont* 87(2): 110-8.

Helmstater GC (1964) : Principles of psychological measurement. New York, Appleton-Century-Crofts.

Henderson WG and Meneley GJ (1977) : Trend in access to primary medical and dental services in Iowa. Report No. 5, Iowa Primary Medical and Dental Manpower Planning Study, Institute of Urban and Regional Research, University of Iowa, Iowa city.

Hendricks SJH, Freeman R and Sheiham A (1990) : Why inner city mothers take their children for routine medical and dental examinations. *Community Dent Health* 7: 33-41.

Hobdell MH, Burt B and Longhurst P (1975): A method of planning a dental treatment programme for an institutionalized population. *Community Dent Oral Epidemiol* 1, 166-73.

Hoogstraten J, De Haan W and Ter Horst G (1985) : Stimulating the demand for dental care: an application of Ajzen and Fishbein's theory of reasoned action. *Eur J Soc Psychol* 15: 401-14.

Houston WJB : Orthodontics : In Rowe AHR, Alexander AG and Johns RB (eds) : Clinical dentistry (vol.3). Blackwell Scientific Publications, London.

Hunt RJ, Slade GD and Strauss RP (1995) : Differences between racial groups in the impact of oral disorders among older adults in North Carolina. *J Public Health Dent* 55(4): 205-9.

Hunt RJ, Beck JD, Lemke JH, et al: Edentulism and oral health problems among elderly rural Iowans: The Iowa 65+ Rural Health Study. *Am J Public Health* 75:1177-81.

Hunt RJ, Levy SM and Beck JD (1990) : The prevalence of periodontal attachment loss in an Iowa population aged 70 and older. *J Public Health Dent* 50: 251-6.

Hunt SM and McEvan J (1980) : The development of a subjective health indicator. *Soc Health Illness* 2: 231-46.

Hunt S, McEwan J and McKenna SP (1986) : Measuring health status. Croom Helm. Beckenham.

Hunt SM, McKenna SP, McEwen J, Williams J and Papp E (1981) : The Nottingham health profile: subjective health status and medical consultation. *Soc Sci Med.* 15a: 221-9.

Hutchinson A, and Fowler P (1992) : Outcome measures for primary health care: What are the research priority? *Br J Gen Pract* 42: 227-31.

Hyland ME (1992). A reformulation of quality of life for medical science. *Qual Life Res* 1(4): 267-72.

Ignatieff M (1984) : The needs of strangers. Chatto and Windus, London.

Ingersoll B, Ingersoll T, McCutcheon W and Seime R (1979) : Behavioural dimensions of dental practice: a national survey. West Virginia University School of Dentistry.

Ismail AI, Burt BA and Eklund SA (1983) : Epidemiologic patterns of smoking and periodontal disease in the United States. *J Am Dent Assoc.* 106: 607- 21.

Jeffers JR, Bognanno MF and Bartlett JC (1971) : On the demand versus need for medical services and the concept of "shortage". *Am J Pub Health* 61: 46-63.

Jenkinson C, Coulter A and Wright L (1993) : Short form 36 (SF36) health survey questionnaire: normative data for adults of working age. Br Med J 306: 1437-40.

Jensen UJ and Mooney G (1990) : Changing values: Autonomy and Paternalism in medicine and health care. In Jensen UJ and Mooney G: Changing values in medicine and health care. John Wiley and Sons, Chicester.

Johnson NW (1990) In Elderton RJ (ed) : Evolution in dental care. Clinical Press Limited, Bristol.

Johnson NW and Colman G (1986) : Dental caries. In Rowe AHR, Alexander AG and Johns RB (eds) : Clinical dentistry (vol.3). Blackwell Scientific Publications, London.

Jones JK and Triplett RG (1992) : The relationship of cigarette smoking to impaired intraoral wound healing. *J Oral Maxillofac Surg* 50: 237-9.

Kadir RA (1992) : Projecting dental treatment needs of the west Malaysian population for dental caries and periodontal diseases. PhD thesis. The University of Michigan, Ann Arbor.

Kaplan RM, Bush JW and Berry CC (1976) : Health status: types of validity and the Index of Well-Being. Health Serv Res 11: 478-507.

Kapur K, Soman S, and Yurkstas A (1964) : Test foods for measuring masticatory performance of denture wearers. *J Prosthet Dent* 14: 483.

Kay EJ and Knill-Jones R (1992) : Variation in restorative treatment decisions: application of Receiver Operating Characteristic curve (ROC) analysis. *Community Dent Oral Epidemiol* 20: 113-7.

Kay EJ, Watt A, Paterson RC and Blinkhorn AS (1988) : Preliminary investigation into the validity of dentist's decisions to restore occlusal surfaces of permanent teeth. *Community Dent Oral Epidemiol* 16: 91-4.

Kegeles SS (1963) : Why people seek dental care: a test of conceptual formulation. *J Health Soc Beh* 4: 166-73.

Kegeles SS and Lund AK (1982) : Adolescents' health belief and acceptance of a novel preventive dental activity: replication and extension. *Health Education Quarterly* 9:192-208.

Kickbush I (1986) : Life-styles and health. *Soc Sci Med* 22: 117-24.

Kieser JB (1990) : Periodontics ; a practical approach. Wright, London.

Kiyak A (1984) : Utilization of dental services by the elderly. *Gerodontology* 3:17-25.

Kline P (1976). A handbook of test construction. London, Methuen.

Knazan YL (1986) : Application of PRECEDE to dental health promotion for a Canadian well-elderly population. *Gerodontics* 2:180-5.

Knudson J (1979) : Controlling the cost of dental care. *Am J Public Health.* 69: 647-50.

Kornman KS and Löe H (1993) : The role of local factors in the etiology of periodontal diseasesl diseases. *Periodontology 2000.* 2: 82-97.

Kress GC (1980) : Toward a definition of the appropriateness of dental treatment, *Public Health Reports*. 95 (6) : 564-571.

Kressin NR, Reisine S, Locker D, Maas WR and Slade GD (1996) : Symposium papers: Symposium on Self-Reported Assessments of Oral Health Outcomes. *J Dent Educ* 60(6): 485-519.

Lam and Koo J (1983) : Accurate prediction of duodenal-ulcer healing rate by discriminant analysis. *Gastroenterology* 85:403-12.

Lavstedt S (1975) : A methodological roentgenological investigation on marginal alveolar bone loss. *Acta Odontol Scand* 33: supplement 67

Leake J (1990) : An index of chewing ability. *J Public Health Dent.* 50: 262-7.

Leao ATT and Sheiham A (1995). Relationship between clinical dental status and subjective impacts on daily living. *J Dent Res* 74(7): 1408-13.

Leao ATT and Sheiham A (1996) : The development of measures of dental impacts on daily living. *Community Dental Health* 13:22-6.

Lederer K (1980) (ed) : Human needs: A contribution to the current debate. Oelgeschlager, Gunn & Hain, Cambridge.

Lemeshow S, Hosmer DW, Klar J and Lwanga SK (1990) : Adequacy of sample size in health studies. John Wiley & Sons (on behalf of the World Health Organization), New York.

Levy SM, Heckert DA, Beck JD and Kohout FJ (1987) : Multivariate correlates of parodontal healthy teeth in elderly population. *Gerodontics* 3: 85-8.

Lindhe J, Haffajee AD and Socransky SS (1983) : Progression of periodontal disease in adult subjects in the absence of periodontal therapy. *J Clin Periodontol* 10: 433-42.

Linn EI (1966). Social meanings of dental appearance. *J Health & Human Behav* 7: 289-95.

Linn EI (1976). Teenagers' attitudes, knowledge, and behaviours related to oral health. *J Am Dent Assoc* 92.

Lipton JA (1991) : Orofacial pain in the US adult population. J Dent Res 70:1309 Locker D. (1993) : Subjective reports of oral dryness in an older adult population. *Community Dent Oral Epidemiol* 21: 165-8.

Liss PE (1986) : A theory of the concept of need. Med no 10/86. Department of Health and Society, Linköing University, Linköping.

Liss PE and Nordenfelt (1990) : Health care need, values and change: How changed values influence an evaluative concept. In Jensen UJ and Mooney G: Changing values in medicine and health care. John Wiley & Sons, Chicester.

Lissitz RW and Green SB (1975). Effect of the number of scale points on reliability: a Monte Carlo Approach. *J Appl Psychol* 60: 10-3.

Locker D (1988a) : Measuring oral health : A conceptual framework. *Community Dental Health* 5: 3-18.

Locker D (1988b) : The symptom iceberg in dentistry: treatment -seeking in relation to oral and facial pain. *J Canadian Dent Assoc* 54(4): 271-4.

Locker D (1989) : An introduction to behavioural science and dentistry. Routledge, London

Locker D (1992) : The burden of oral disorders in a population of older adults. *Community Dent Health.* 9: 109-24.

Locker D and Grushka M (1987) : The impact of dental and facial pain. *J Dent Res* 66: 1414-17.

Locker D and Leake JL (1993) : Risk indicators and risk markers for periodontal disease experience in older adults living independently in Ontario, Canada. *J Dent Res* 72(1): 9-17.

Locker D and Miller Y (1994). Evaluation of subjective oral health status indicators. *J Public Health Dent* 54(3): 167-76.

Locker D and Slade G (1994) : Association between clinical and subjective indicators of oral health status in an older adult population. *Gerodontology* 11(2): 108-14.

Löe H (1993) : Periodontal diseases: a brief historical perspective. *Periodontology 2000* 2: 7-12.

MacEntee MI, Stolar E and Glick N (1993) : Influence of age and gender on oral health and related behaviour in an independent elderly population. *Community Dent Oral Epidemiol* 21(4): 234-9.

MacFarlane GD, Herzberg MC, Wolff LF and Hardie NA (1992) : Refractory periodontitis associated with abnormal polymorphonuclear leukocyte phagocytosis and cigarette smoking. *J Periodontol* 63(11): 908-13.

MacGregor IDM and Rugg-Gunn AJ (1984) : Uninstructed tooth brushing behaviour in young adults in relation to cigarette smoking in Newcastle. *Community Dent Oral Epidemiol* 12: 358-60.

Manly RS and Shiere FR (1950) : The effect of dental efficiency on mastication and food

preference. *Oral Surg* 3:674.

Manly RS and Vinton P (1951) : A survey of the chewing ability of denture wearers. *J Dent Res* 30: 314.

Magi M and Allander E (1981) : Towards a theory of perceived and medically defined need. *Soc Health Illness* 3(1): 49-65.

Maizels J, Maizels A and Sheiham A (1991) : Dental disease and health behaviour: the development of an interactional model. *Community Dent Health* 8: 311-21.

Maizels J, Maizels A and Sheiham A (1993) : Sociodental approach to the identification of dental treatment-need groups. *Community Dent Oral Epidemiol* 21:340-6.

Manji F and Sheiham A (1986) : CPITN findings and the manpower implications of periodontal treatment needs for Kenya. *Community Dent Health* 3: 143-51.

Marmot MG (1994) : Social differentials in health. *J Am Acad Art Sci* 123(4): 197-216.

Martin J, Meltzer H, Elliot D (1988). The prevalence of disabilities among adults: OPCS Surveys of disability in Great Britain, Report no.1, HMSO, London.

Matthews DC and McCulloch CAG (1993) : Evaluating patient perceptions as short term outcomes of periodontal treatment: A comparison of surgical and non-surgical therapy. *J Periodontal* 64: 990-7.

Matthew GK (1971) : Measuring need and evaluating services. In G. Mclachlan (ed) : Portfolio for health: problems and progress in medical care, sixth series. Oxford University Press. London.

Mautsch W and Sheiham A (1995) : Promoting oral health in deprived community. German Foundation for International Development, Berlin.

McDowell I and Newell C (1987) : Measuring health : a guide to rating scales and questionnaires. Oxford University Press, Oxford, pp. 12-35.

McKenna SP, (1993) : The Nottingham Health Profile. Paper presented to the Fifth European Health Services Research Conference, Maastricht, December.

McKinlay J (1972) : Some approaches and problems in the study of the use of services; an overview. *J Health Soc Behaviour* 13: 115-52.

McPhee IT (1967) : Periodontal scoring; a simple method of periodontal scoring as a basis for treatment planning in teaching hospital and general practice. *Dent Pract Dent Rec* 17:269-73.

McPherson K, Wennberg JE and Hovind DB (1982) : Small area variations in the use of common surgical procedures: an international comparison. *New Eng J Med* 307: 1310-14.

Mechanic D (1979) : The stability of health and illness behaviour: results from a 16-year follow up. *Am J Publ Health* 6: 1142-5.

Mechanic D and Volkart E (1962) : Stress, illness behaviour and sick role. *Am Soc Rev* 25: 51.

Medical Research Council (1989) : National survey of health and development questionnaire, Department of Epidemiology and Public Health, University College London.

Meenan RF, Gertman PM and Mason JH (1980) : Measuring health status in arthritis: the arthritis impact measurement scales. Arthritis Rheum 23(2): 146-52.

Mendel I (1994) : Smoke signals: an alert for oral disease. *J Am Dent Assoc* 125: 872-8.

Merrett MCW and Elderton RJ (1984) : An in vitro study of restorative dental treatment decision and dental caries. *Br Dent J* 157: 128-33.

Modeer T, Lavstedt S, and Ahlund C (1980) : Relation between tobacco consumption and oral health in Swedish schoolchildren. *Acta Odontol Scand* 38: 223-12.

Mooney G and Jensen UJ (1990) : Changing values and changing policy. In Jensen UJ and Mooney G: Changing values in medicine and health care. John Wiley & Sons, Chicester pp 179-87.

Moore WEC, Holdeman LV, Smibert RM, Good IJ, Burmeister JA and Ranny RR (1982) : Bacteriology of experimental gingivitis in young adult humans. *Infect Immun* 38: 651-7.

Mootz M. (1986) : Health indicators. *Soc Sci Med* 22 (2) : 255-63.

Morita M, Kimura T, Kanegae M, Ishikawa A and Watanabe T (1994) : Reasons for extraction of permanent teeth in Japan. *Community Dent Oral Epidemiol* 22: 303-6.

Mullen PD, Hersey JC and Iverson DC (1987) : Health behaviour models compared. *Soc Sci Med* 24: 973-81.

Na Nakorn S, Grisanaphuti W, Khammeng T and Ratanasiri A. (1993) : An assessment of communities health problems and felt needs in Khon Kaen, Thailand : A parcipatory action research (Research report), Khon Kaen University Press, Khon Kaen, 196-216.

National Center for Health Statistics (1973) : Plan and Operation of the Health and Nutrition Examination Survey. United States 1971-1973. Vital and Health Statistics, Series 1 (10a,10b). HEW Publ. Washington.

Newcomb GM (1975) : Periodontal treatment requirements of a group of defence forces' personnel. *Aust Dent J* 20: 183-6.

Newman MG, Kornman KS and Holtzman S (1994) : Association of clinical risk factors with treatment outcomes. *J Periodontol* 65:489-97.

Nikias GM (1985) : Oral disease and the quality of life. *Am J Public Health* 775: 11-2.

Nikias SM, Sollesito WA and Fink R (1979) : An oral health index based on ranking of oral health status profiles by panels of dental professionals. *J Public Health Dent* 39 : 16-26.

Nikiforuḳ G (1985) : Understanding dental caries: etiology and mechanisms; basic and clinical aspects. Karger, New York.

Nunnally J (1978). Psychometric Theory, 2nd edn, New York, McGraw Hill.

Norusis MJ (1988). SPSS/PC+ Advanced statistics , Chicago, SPSS Inc.

Oliver RC, Brown LJ and Löe H (1993) : Periodontal treatment needs. *Periodontology 2000* 2: 150-60.

O'Brien KD (1996) : Proceeding of the conference 'Assessing oral health outcomes: measuring health status and quality of life'. University of North Carolina, Chapel Hill.

Oliver RC, Brown LJ and Löe H (1989) : An estimate of periodontal treatment needs in the US based on epidemiological data. *J Periodontol* 60: 371-80.

O'Mullane DM and Robinson ME (1977) : The distribution of dentists and the uptake of dental treatment by school children in England. *Community Dent Oral Epidemiol* 5: 156-9.

Oral Health Coordinating Committe, Public Health Service (1993) : Toward improving the oral health of Americans: an overview of oral health status, resources and care delivery. *Public Health Rep* 108(6): 657-72.

Parsons T (1951) : The social system. Free Press, Glencoe, Illinois.

Patrick D (1982) : The measurement of health. In Patrick D. and Scamber G. (eds) : Sociology as applied to medicine. Bailliere Tindall, London.

Patrick DL and Bergner M (1990) : Measurement of health status in the 1990s. *Annu Rev Public Health* 11:16:166-83.

Peter J and Chinsky R (1974) : Sociological aspects of cleft palate adults I : marriage. *Cleft Palate J* 11: 259-309.

Petersen PE and Pedersen KM (1984) : Socioeconomic demand model for dental visits. *Community Dent Oral Epidemiol* 12: 361-5.

Petersen PE and Holst D (1995) : Utilization of dental services. In Cohen LK and Gift HC: Disease prevention and oral health promotion. Munksgaard, Copenhagen, pp 341-79.

Pilot T (1980) : Analysis of the overall effectiveness of treatment of periodontal disease. In Shanley (ed) : Efficacy of treatment procedures in periodontics: Proceeding of a workshop in Dublin. Quintssence, Chicago, pp 213-34.

Pilot T (1990) In Elderton RJ (ed) : Evolution in dental care. Clinical Press Limited, Bristol.

Pindborg JJ (1947) Tobacco and gingivitis I : Statistical examination of the significance of tobacco in the development of ulceromembrarous gingivitis and in the formation of calculus. *J Dent Res* 26: 261-4.

Pitt Ford RJ (1986) : Restoration of teeth; Principles of restorations. In Rowe AHR, Alexander AG and Johns RB (eds) : Clinical dentistry (vol.3). Blackwell Scientific Publications, London.

Preber H and Bergström J (1986) : The effect of non-surgical treatment on periodontal pockets in smokers and non-smokers. *J Clin Periodontol* 13: 319-23.

Preber H and Bergström J (1990) : Effect of cigarette smoking on periodontal healing following surgical therapy. *J Clin Periodontol* 17: 324-8.

Preber H, Bergström J and Linder L (1992) : Occurrence of periopothogens in smoker and non-smoker patients. *J Clin Periodontol* 19: 667-71.

Preber H, Kant T and Bergström J (1980) : Cigarette smoking, oral hygiene and periodontal health in Swedish army conscripts. *J Clin Periodontol* 7: 106- 11.

Ranny RR (1993) : Classification of periodontal diseases. *Periodontology 2000* 2: 13-25.

Razak IA and Ali MM (1989) : Unperceived dental needs in a group of Malaysian elderly patients. Annuals of the Academy of Medicine, Singapore. 18(5): 516-8.

Reisine ST (1981) : Theoretical considerations in formulating sociodental indicators. *Soc Sci Med* 15A: 745-50.

Reisine ST and Bailit HL (1980) : Clinical oral health status and adult perception of oral health. *Soc Sci Med* 14: 597.

Reisine ST, Fertig J, Weber J and Leder S (1989) : Impact of dental conditions on patients' quality of life. *Community Dent Oral Epidemiol* 17: 7-10.

Riefkohl R, Wolfe J, Cox E and McCarty K (1986) : Association between cutaneous occlusive vascular disease, cigarette smoking and skin slough after rhytidectomy. *Plastic Reconstruct Surg* 77: 592-5.

Rivera-Hidalgo F (1986) : Smoking and Periodontal disease: A review of the literature. *J Periodontol* 57(10): 617-24.

Roberts-Thompson TK, Brennan DS and Spencer AJ (1995) : Social inequality in the use and comprehensiveness of dental services. *Aust J Public Health* 19(1): 80-5.

Robinson PG, Nadanovsky P, Sheiham A (1996) : Perceived and normative treatment need. The British Society for Dental Research, 44th Annual General Meeting, The University of Bristol, Abstract #216.

Rose G (1993) : The strategy of preventive medicine. Oxford Medical Pub. Oxford.

Rosenberg D, Kaplan S, Senie R and Badner V (1988) : Relationships among dental functional status, clinical dental measures, and generic health measures. *J Dent Educ* 52 (11): 653-57.

Rosenoer LM and Sheiham A (1993) : Dental impacts on daily life and satisfaction with teeth in relation to dental status in adults, *J Oral Rehabil* 22(7): 469-80.

Rosenstock IM (1974) : The health belief model and preventive health behaviour. *Health Educ Monograph.* 2: 354-86.

Rosling B, Nyman S, Lindhe J and Jern B (1976) : The healing potential of the periodontal tissues following different techniques of periodontal surgery in plaque-free dentitions. A 2-year study. *J Clin Periodontol* 3: 233-50.

Rytmöaa I, Jarniven V and Jarniven J (1979) : Variation in caries recording and restorative treatment plan among universities teachers. *Community Dent Oral Epidemiol* 7:335-9.

Sackett DL (1976) : The magnitude of compliance and non compliance. In Sackett DL and Haynes RB (eds) : Compliance with therapeutic regimens. Johns Hopkins University Press. Baltimore. pp. 9-25.

Sackett DL, Chambers LW, MacPherson AS, Goldsmith CH and McCauley RG (1977) : The development and application of indices of health: general methods and summary of results. *Am J Public Health* 67: 423-8.

Sakki TK, Knuuttila MLE, Vimpari SS and Hartikainen MSL (1995) : Association of lifestyle with periodontal health. *Community Dent Oral Epidemiol* 23: 155-8.

Schenkein HA, Gunsolley JC, Koertge TE, Schenkein JG and Tew JG (1995) : Smoking and its effects on early onset periodontitis. *J Am Dent Assoc* 126:1107-13.

Schaub RMH (1984) : Barriers to effective periodontal care. University of Groningen, Groningen.

Schonfeld WH (1981) : Estimating dental treatment needs from epidemiological data. *J Public Health Dent* 41 (1) 25-32.

Schou L, Currie C and McQueen D (1990) : Using a "lifestyle" perspective to understand tooth brushing behaviour in Scottish schoolchildren. *Community Dent Oral Epidemiol* 18: 230-4.

Schuurs AHB, Duivenvoorden HJ, Thoden van Velzen SK, Verhage F and Makkes PC. (1990) : Value of teeth. *Community Dent Oral Epidemiol* 18(1): 22-6.

Schwarz E (1986) : Response to paper by Sogaard. In Gjermo P (ed) : Promotion of self-care in oral health. Scandinavian Working Group for Preventive Dentistry, Dental Faculty, 70-5.

Scrivens E, Cunningham D, Chailton J and Holland W (1985) : Measuring the impact of health interventions: A review of available instruments. *Effective Health Care*. 2,47-59.

Shaw WC (1981) : Factors influencing the desire for orthodontic treatment. *Eur J Orthodont* 3: 151-62.

Shaw WC, Addy M and Ray C(1979) : Dental and social effects of malocclusion and effectiveness of orthodontic treatment : a review. *Community Dent Oral Epidemiol* 8: 36-45.

Shaw WC, Meek SC and Jones DS (1980) : Nicknames, teasing, harassment and the salience of dental features among school children. *Br J Orthodont* 7: 75-80.

Shaw WC, O'Brien KD, Richmond S and Brook P (1991 a) : Quality control in orthodontics: risk/benefit considerations. *Br Dent J* 170 (7) : 252.

Shaw WC, Richmond S, O'Brien KD and Brook P (1991 b) : Quality control in orthodontics: Indices of Treatment Need and Treatment Standard. *Br J Orthodont* 170(3), 107-12.

Sheiham A (1971) : Periodontal disease and oral cleaniness in tobacco smokers. *J Periodontol* 42: 259-64.

Sheiham A (1986) : Theories explaining health behaviour. Position paper in Gjermo P. (ed) : Promotion of self-care in oral health. Scandinavian Working Group of Preventive Dentistry, Dental Faculty, Oslo.

Sheiham A (1991) : Public health aspects of periodontal diseases in Europe. *J Clin Periodontol* 18: 362-9.

Sheiham A (1996) : Is there a need for the chemical prevention of gingivitis to prevent severe periodontitis? *Periodontology 2000* (in press).

Sheiham A, Maizels JE and Cushing AM (1982): The concept of need in dental care. *Int Dent J* 32 (3): 265-70.

Shugars D and Bader J (1992) : Appropriateness of restorative treatment recommendations: a case for practice-based outcomes research. *J Am Coll Dent* 59:7-13.

Slade GD (1996) :. Proceeding of the conference 'Assessing oral health outcomes: measuring health status and quality of life'. University of North Carolina, Chapel Hill.

Slade GD, Hoskin GW and Spencer AJ (1995). Trends and fluctuations in the impact of oral conditions among older adults during a one year period. *Community Dent Oral Epidemiol* (In press).

Slade GD and Spencer AJ (1994) : Development and evaluation of the Oral Health Impact Profile. *Community Dent Health* 11: 3-11.

Slade GD, Spencer AJ, Locker D, Hunt RJ, Strauss RP and Beck JD (1996) : Variations in the social impact of oral conditions among older adults in South Australia, Ontario and North Carolina. *J Dent Res* (In press).

Smith JM and Sheiham A (1979) : How dental conditions handicap the elderly. *Community Dent Oral Epidemiol* 7: 305-10.

Smith JM and Sheiham A (1980) : Dental treatment needs and demands of an elderly population in England. *Community Dent Oral Epidemiol* 8 : 360-64.

Socransky SS, Haffajee AD, Goodson JM and Lindhe J (1984) : New concepts of destructive periodontal disease. *J Clin Periodontol* 11: 21-32.

Soderfeldt B, Palmqvist S and Arnbjerg D (1992) : Factors affecting attitudes toward dental appearance and dental function in a Swedish population aged 45-69 years. *Community Dent Health* 10(2): 123-30.

Sogaard AJ (1993) : Theories and models of health behaviour. In Schou L and Blinkhorn A.S. (eds) : Oral health promotion. Oxford Medical Publications, Oxford.

Sogaard AJ and Holst D (1988) : The effect of different school based dental health education programmes in Norway. *Community Dent Health* 5: 169-84.

Sogaard AJ, Tuominen R, Holst D and Gjermo P (1987) : The effect of 2 teaching programs on the gingival health of 15-year-old schoolchildren. *J Clin Periodontol* 14: 165-70.

Solomon HA, Priore RL and Bross IDL (1968) : Cigarette smoking and periodontal disease. *J Am Dent Assoc* 77: 1081-4.

Spratley MH (1988) : Posterior edentulousness and the prescription of partial dentures. *Aus Dent J* 33(1): 43-6.

Spencer JA (1980) : The estimation of need for dental care. *J Public Health Dent* 40(4): 311-27.

Srisilapanan P (1994) : Assessment of normative and perceived dental treatment need in the older population: a socio-behavioural approach. PhD protocol, Department of Epidemiology and Public Health, University College London.

Streiner GL, Norman DR (1995). Health measurement scales - A practical guide to their development and use, 2nd edn, Oxford, Oxford University Press.

Strauss RP and Hunt RJ (1993) : Understanding the value of teeth to older adults: influences on the quality of life. *J Am Dent Assoc* 124: 105-10.

Sweet JB and Butler DP (1979) : The relationship of smoking to localized osteitis. *J Oral Surg* 37: 732-5.

Teeling-Smith G (1973) Health Economics and Cost-Benefit Analysis in health planning and organization of medical care. World Health Organization. Copenhagen. pp.34-45.

Ternoven T and Knuuttila M (1988) : Awareness of dental disorders and discrepancy between "objective" and "subjective" dental treatment needs. *Community Dent Oral Epidemiol* 16: 345-8.

The Association of State and Territorial Dental Health Directors (1995) : Assessing oral health needs: ASTDD seven-step model. National MCH Clearinghouse, McLean.

Thompson J (1984) : Compliance. In Fitzpatrick R, Hinton J, Newman S, Scambler and Thompson J : The experience of illness. Tavistock Publications, London.

Tsakos G (1995) : A comparative study of socio-dental indicators and treatment needs in two elderly populations in Greece and Great Britain. PhD protocol, Department of Epidemiology and Public Health, University College London.

Tugwell P, Bennett KJ, Sackett D, and Haynes B (1994): Relative risks, benefits and costs of intervention. In: Warren KS and Mahmoud AAF (eds). Tropical and geographic medicine. New York: McGraw Hill, pp. 1097-1113.

Tulloch JFC and Antczak-Bouckoms AA (1987) : Decision analysis in the evaluation of clinical strategies for the management of mandibular third molars. *J Dent Educ* 51 (11) : 652-60.

US Department of Health, Education and Welfare (1969) : Toward a social report. US Government Printing Office. Washington.

Waerhaug J (1952) : Gingival pockets: anatomy, pathology, deepening and elimination. *Odontol Tidskr*: 60 (suppl).

Ware JE, Brook RH, Davies AR and Lohr KN (1981) : Choosing measures of health status for individuals in general populations. *Am J Public Health*, 71: 620-4.

Weisenberg M, Kegeles SS and Lund AK (1980) : Children's health belief and acceptance of dental preventive activity. *J Health Soc Beh* 21:59-74.

Williams RGA, Johnston M, Willis LA and Bennett AE (1976) : Disability: a model and measurement technique. *Br J Prev Soc Med* 30: 71-8.

Wolfson MC (1994) : Toward a system of health statistics. *J Am Acad Art Sci* 123(4): 181-196.

Wood PHN (1980) : Appreciating the consequences of disease: the international classification of impairments, disabilities, and handicaps. *WHO Chronicle*, 34: 376-80.

Woolgrove J, Cumberbatch G and Gelbier S (1987) : Understanding dental attendance behaviour. *Community Dent Health* 4: 215-22.

World Health Organization (1977) : Oral Health Surveys : Basic methods. 2nd ed. WHO. Geneva.

World Health Organization (1978 a) : The epidemiology, etiology and prevention of periodontal disease. Report of a WHO Scientific Group. Technical Report Series 621. WHO, Geneva.

World Health Organization (1978 b) : Primary Health Care - Report on the International Conference on Primary Health Care, Ama-Ata, USSR. WHO, Geneva.

World Health Organization (1980) : International classification of impairments, disabilities, and handicaps: a manual of classification relating to the consequences of disease. Geneva.

World Health Organization (1982) : A review of current recommendations for the organization and administration of community oral health services in Northern and Western Europe. Report of a WHO workshop, Copenhagen.

World Health Organization (1983) : Health for all by the year 2000. WHO, Geneva.

World Health Organization (1985) : Oral health care systems: an international collaborative study. Quintessence Pub. London.

World Health Organization (1987) : Oral Health Surveys : Basic methods. 3rd ed. WHO. Geneva.

World Health Organization (1989) : Health through oral health; Guideline for planning and monitoring for oral health care. Joint WHO/FDI working group . Quintessence. Chicago.

Yang MCK, Marks RG, Clark WB and Magnusson I (1992) : Prediction power of various models for longitudinal change. *J Clin Periodontol* 19: 77-83.

APPENDICES

APPENDIX 1

QUESTIONNAIRE

(English version)

ORAL HEALTH SURVEY QUESTIONNAIRE :

"INTEGRATING SOCIO-BEHAVIOURAL FACTORS IN DENTAL TREATMENT NEED ESTIMATION"

DEPARTMENT OF EPIDEMIOLOGY AND PUBLIC HEALTH,
UNIVERSITY COLLEGE LONDON.

ID. Number	Location	Date (m)	Date (yr)
☐☐☐☐	☐☐	☐☐	☐☐
(1-4)	(5-6)	(7-8)	(9-10)

INTRODUCTION

We are interviewing people about their experiences about General health, and their mouth and teeth problems. We are also interested in their views about oral health such as dental treatment. There is no right or wrong answer. Please feel free to answer and to ask anything you do not understand.

PART I - DEMOGRAPHIC DATA

First, it would help to know a little about you.
Name(Mr.,Ms.,Mrs.)_____

Age ☐☐ years (11-12)

Marital status ☐ (13)

1 Single
2 Married
3 Divorced
4 Widowed

Occupation ☐ (14)

1 Agriculture 2 Labour
3 Employee 4 Shop owner
5 Government officer
6 Familial industry
7 Professional, administrator
9 Other (specify)_____

Highest education level ☐ (15)

0 None
1 Grade 4
2 Grade 6-7
3 Grade 9
4 Grade 12 or equivalent
5 Diploma or equivalent
6 Bachelor degree or equivalent
7 Higher than Bachelor degree

PART 2 GENERAL HEALTH

G1. In general, would you say your health is: ☐ (16)

1 Excellent 2 Very good 3 Good 4 Fair 5 Poor

G2. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

a) Cut down the amount of time you spent on work or other activities

1 Yes 2 No ☐ (17)

b) Accomplished less than you would like

1 Yes 2 No ☐ (18)

c) Were limited in the kind of work or other activities

1 Yes 2 No ☐ (19)

d) Had difficulty performing the work or other activities (eg. it took extra effort)

1 Yes 2 No ☐ (20)

G3. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious) ?

a) Cut down the amount of time you spent on work or other activities

1 Yes 2 No ☐ (21)

b) Accomplished less than you would like

1 Yes 2 No ☐ (22)

c) Didn't do work or other activities as carefully as usual

1 Yes 2 No ☐ (23)

G4. During the past week, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours or groups?

☐ (24)

1 Not at all 2 Slightly 3 Moderately 4 Quite a bit 5 Extremely

---

G5. In comparison to other people the same age, would you say your health is

☐ (25)

1 Much better 2 Slightly better 3 Similar 4 Slightly worse 5 Much worse

---

G6. During the past few years, your health is better or worse ☐ (26)

1 Much better 2 Slightly better 3 Similar 4 Slightly worse 5 Much worse

---

PART 3 ORAL IMPACT ON DAILY PERFORMANCE (OIDP)

I would like to know about the problems from oral conditions that you has had on your daily living in the last six months. (Ask these questions for each activity in Table 1)

Question 1

a) In the past six months, have problems with your mouth, teeth or denture caused you any difficulty in..*(performance)*...?

0 No (Go to next activity)
- Yes (Go to b.)

b) If yes, how often?

- Less than once a month (Go to c.)
2 Once or twice a month
3 Once or twice a week
4 3-4 times a week
5 Every or nearly everyday (5+ times /week)

c) If less than once a month, around how many days in total?

1 Up to 5 days in total
2 Up to 15 days in total
3 Up to 30 days in total
4 Up to 3 months in total
5 More than 3 months in total

Question 2

I am going to ask you now about the severity of this problem when it happened. Using a scale from 0 to 5, where 0 is no effect and 5 is a very severe effect, which number would you say reflect the severity of this difficulty in ..*(performance)*.. on your daily living?

0 1 2 3 4 5

Question 3

What has been the major symptom of this difficulty? (Read)

1 Pain
2 Discomfort
3 Limitation in function (eg chewing, biting or opening mouth wide)
4 Appearance dissatisfaction
5 Other (specify)

Question 4

Approaching the cause in more detail, can you specify which problem of your mouth, teeth, or dentures are the causes of this difficulty?

00 Cannot specify

Teeth:

01 toothache
02 tooth loss
03 loose tooth
04 colour of teeth
05 position of teeth (eg. crooked or projecting, gap)
06 shape or size of teeth

Mouth :

07 deformity of mouth or face
08 oral ulcer or sore spots (not denture related)
09 burning sensation of the mouth
10 bad breath
11 taste disturbance
12 unpleasant taste

Gums:

13 bleeding gums
14 receding gum
15 gum abscess

Jaw:

16 clicking or grating noise in jaw joint
17 locking jaw

Previous treatment:

18 improper filling (eg. broken, colour)
19 loose or ill-fitting denture
20 orthodontics appliances

88 Other (specify)
99 Missing answer

Table 1.

(27-62)

Activity	Q1	Q2	Q3	Q4
1. **Eating and enjoy your food**				
2. **Speaking and pronouncing clearly**				
3. **Cleaning your mouth**				
4. **Doing light physical activities (eg. cleaning, cooking)**				
5. **Sleeping and relaxing**				
6. **Smiling, laughing and showing your teeth without embarrassment**				
7. **Maintain your usual emotional state without being irritable**				
8. **Carry out your major work or role**				
9. **Contact with people (eg. going out with friend)**				

PART 4 - PROPENSITY OF BEHAVIOUR: Socio-psychological factors

Now, I would like to ask some questions about what you do or what you think which are related to teeth and mouth. There is no right or wrong, please feel free to answer what you really did and thought.

P1.a) Whether you had "had a chance" to clean your teeth yesterday? ☐(63)

0 *No* (Skip to Q2)

If yes; b) How many times was this ?

1 *Once*
2 *Twice*
3 *More than twice*

c) How do you clean your teeth? ☐ (64)

1 Tooth brushing 2 Tooth brushing and other(specify) _____
3 Other method (specify)_____

P2. a) How often did you add sugar in your noodle? (Read) ☐ (65)

1 *Never*
2 *Rarely*
3 *Sometimes*
4 *Often/ always* Number of teaspoon ☐☐(66-67)

b) How often did you add sugar in your drink (eg tea coffee)? (Read) ☐ (68)

1 *Never*
2 *Rarely*
3 *Sometimes*
4 *Often/ always* Number of teaspoon _____ ☐☐(69-70)

c) How many times do you have desert or sweet snack yesterday?

Number of times _____ ☐ (71)

d) How many times do you have sweet drink (eg. juice, soda, tea, coffee) yesterday?

Number of times _____ ☐ (72)

P3. a) Do you smoke cigarettes these days?

If no, Have you ever smoked as a regular habit? ☐ (73)

1 *Never*
2 *Has smoked but not now*
3 *Smoked now*

b) If smoked now,
Do you smoke manufactured cigarette or hand-rolled cigarette?
b1) If smoke manufactured cigarette:

How many cigarettes do you smoke on average a day? ☐☐ (74-75)

Number of cigarettes/day _____

b2) If smoke hand-rolled cigarette:

How many grams of tobacco you use on average a week? ☐ (76)

Number of grams/week _____

P4. a. About how long ago was your last visit to the dentist? ☐ (77)

0 Never
1 More than 20 years ago
2 More than 10 up to 20 years ago
3 More than 5 up to 10 years ago
4 More than 2 up to 5 years ago
5 More than 1 up to 2 years ago
6 Less than 1 years ago

b. How many times have you been to a dentist in the last 2 years? ☐☐ (78-79)

00 None
Number of times _____

c. If ever, What is the reason for your dental visit?
(Probe, could be more than one reason)

1. Check-up or prophylactic purpose ☐ (80)

2. Concern from early sign or symptom of oral conditions ☐ (81)

3 Concern from late symptom of oral conditions ☐ (82)

4. Dental appointment ☐ (83)

*4. Other reason (specify)*_____ ☐ (84)

P5. Would you say you are the kind of person who: (Read) ☐ (85)

1 Take a lot of trouble over your teeth
2 Take a fair amount of trouble over your teeth
3 Take hardly any trouble over your teeth

P6. Do you think that dental treatments can help your teeth and mouth more healthy?(Probe)

1 Yes/ absolutely ☐ (86)
2 Probably/ sometimes/ not sure
3 No
4 Don't know

P7. I would like to ask you some questions on how you feel about going to the dentist. Some people feel very frightened, others feel a bit nervous, while yet others find they don't mind at all.

What would you feel: (Read) ☐ (87)

1 Really frightened, very nervous
2 Fairly nervous
3 A little bit nervous
4 Not at all nervous

P8.a) If you have dental problems, will you go to see the dentist? (Probe)

1 Definitely ☐ (88)
2 Probably/ not sure
3 No

b) If not definitely; What makes it difficult for you to visit a dental personnel ? (Probe, could be more than one)

1 Fear ☐(89)
2 Cost ☐(90)
3 Time problem ☐(91)
4 Availability of service ☐(92)
5 Lack of confident in dental personnel's competence ☐(93)
6 Lack of confident in benefit from dental treatment ☐(94)
7 Dissatisfaction to previous dental service ☐(95)
*8 Other (specify)*_____ ☐ (96)

P9. a. Has the dentist or dental personnel or any health worker ever given on how to clean your teeth? ☐ (97)

0 No (Go to P12)

b. If yes; What were you advised to do?

1. Cannot remember/ Not sure (Go to P12)

c. If can remember and explain; Are you following this advice? (Probe)

2. Not at all
3. Partly
4. Fully

P12. Has the doctor or health worker ever given you advice on these topics?

-If yes; Are you following this advice? (Probe)

Code *1 Not at all*
2 Partly
3 Fully

-If no, code 0; Which topic did you ever been advised?
(Probe one topic for self management procedure, and one for medications regimen)

	Code	
a. Self management procedure		
a1. Diet: eg. fat/salt/sugar reduction or avoid raw food	0 1 2 3	☐ (98)
a2. Smoking reduction	0 1 2 3	☐ (99)
a3. Other (specify)_____	0 1 2 3	☐ (100)

b. Medications regimen

b1. Taking routine drug	0 1 2 3	☐ (101)
b2. Medical appointment	0 1 2 3	☐ (102)
b2. Other (specify)_____	0 1 2 3	☐ (103)

Thank you for your co-operation.

Interview time ☐☐ (104-105)

Appointment for the oral examination :

_____

_____

APPENDIX 2

QUESTIONNAIRE

(Thai version)

แบบสอบถาม

"การผสมผสานปัจจัยทางสังคมและพฤติกรรม
ในการประมาณความต้องการจำเป็นของการรักษาทางทันตกรรม"
ภาควิชาระบาดวิทยาและสาธารณสุข, มหาวิทยาลัยคอลเลจลอนดอน

ID. Number	Location	Date (m)	Date (yr)
☐☐☐☐	☐☐	☐☐	☐☐
(1-4)	(5-6)	(7-8)	(9-10)

<u>คำกล่าวนำ</u>

เรากำลังสัมภาษณ์ประชาชนเกี่ยวกับประสบการณ์ทางด้านสุขภาพทั่วไป รวมทั้งประสบการณ์เกี่ยวกับเรื่องของปากและฟัน เรายังสนใจความคิดเห็นเกี่ยวกับสุขภาพช่องปาก เช่น ความคิดเห็นต่อการรักษาทางทันตกรรมและอื่นๆ ด้วย คำถามเหล่านี้ไม่มีคำตอบใดถูกหรือผิด โปรดตอบโดยอิสระ ตามประสบการณ์และความคิดเห็นที่แท้จริงของท่าน และถ้าท่านมีสิ่งใดไม่เข้าใจ โปรดถามได้เต็มที่

เวลาเริ่มถาม __:__

<u>ตอนที่1</u> ข้อมูลทางประชากร

ก่อนอื่น เราขอรู้จักเกี่ยวกับตัวของท่านสักเล็กน้อย

ชื่อ (นาย,นาง,นางสาว)_____

อายุ __ __ ปี (11-12)

สถานภาพสมรส_____ (13)

1. โสด 2. แต่งงาน
3. หย่า 4. ม่าย

อาชีพ ___ ___ (14)

1. เกษตรกร 2. กรรมกร 3. ลูกจ้าง 4. ค้าขาย
5. ข้าราชการ 6. อุตสาหกรรมในครัวเรือน
7. วิชาชีพ, ผู้บริหาร 8. ไม่ทำงาน, แม่บ้าน
9. อื่นๆ (ระบุ)_____

ระดับการศึกษาสูงสุด _____ (15)

0 ไม่มี หรือต่ำกว่า ป. 4
1 ป. 4
2 ป. 6-7
3 มัธยมต้น
4 มัธยมปลายหรือเทียบเท่า
5 อนุปริญญา หรือเทียบเท่า
6 ปริญญาตรี หรือเทียบเท่า
7 สูงกว่าปริญญาตรี

ตอนที่ 2 สุขภาพทั่วไป

G1 โดยทั่วไปแล้ว ท่านเห็นว่าสุขภาพของท่านอยู่ในระดับ (อ่านคำตอบ) _____(16)

1 ยอดเยี่ยม 2 ดีมาก 3 ดี 4 พอใช้ 5 แย่

G2 ในระหว่างสัปดาห์ที่ผ่านมา ท่านได้มีปัญหาเกี่ยวกับการงาน หรือการดำเนินกิจวัตรประจำวัน อันเนื่องจากสุขภาพร่างกายบ้างหรือไม่ ในปัญหาต่อไปนี้

a) ต้องลดเวลาที่เคยใช้ในการทำงานหรือในกิจกรรมอื่นๆ ลง 1 ใช่ 2 ไม่ใช่ (17)

b) บรรลุความสำเร็จในงานน้อยกว่าที่ตั้งใจ 1 ใช่ 2 ไม่ใช่ (18)

c) ต้องจำกัดชนิดของงานหรือกิจกรรมประจำให้น้อยลง 1 ใช่ 2 ไม่ใช่ (19)

d) ประสบความยากลำบากในการทำงาน หรือดำเนินกิจกรรมประจำมากขึ้น (เช่น ต้องใช้ความพยายามมากขึ้น) 1 ใช่ 2 ไม่ใช่ (20)

G3 ในระหว่างสัปดาห์ที่ผ่านมา ท่านได้มีปัญหาเกี่ยวกับการงาน หรือการดำเนินกิจวัตรประจำวัน อันเนื่องมาจากปัญหาทางอารมณ์บ้างหรือไม่ (เช่น จากความวิตกกังวล,ความเครียด หรือความเศร้า)

a) ต้องลดเวลาที่เคยใช้ในการทำงานหรือในกิจกรรมอื่นๆ ลง 1 ใช่ 2 ไม่ใช่ (21)

b) บรรลุความสำเร็จในงานน้อยกว่าที่ตั้งใจ 1 ใช่ 2 ไม่ใช่ (22)

c) ไม่อาจทำงานหรือกิจกรรมอื่นอย่างระมัดระวังได้เท่าที่เคย 1 ใช่ 2 ไม่ใช่ (23)

G4 ระหว่างสัปดาห์ที่ผ่านมา ปัญหาทางร่างกายหรือจิตใจ ได้รบกวนชีวิตทางสังคมตามปกติของท่านกับคนในครอบครัวหรือกับเพื่อนฝูง เพื่อนบ้าน หรือกลุ่มคนที่รู้จักกันมากน้อยเพียงไร?

(อ่านคำตอบ) _____(24)

1. ไม่รบกวนเลย 2. รบกวนเล็กน้อย

3. รบกวนปานกลาง 4. รบกวนมาก

G5 สุขภาพของท่านเป็นอย่างไร เมื่อเปรียบเทียบกับคนรุ่นราวคราวเดียวกันที่รู้จักโดยทั่วไป

1. ดีกว่ามาก _____(25)
2. ค่อนข้างจะดีกว่า
3. เหมือนๆ กัน
4. ค่อนข้างจะแย่กว่า
5. แย่กว่ามาก

G6 ช่วงปีหลังๆ มานี้ คิดว่าสุขภาพของตัวเองดีขึ้นหรือแย่ลง _____(26)

1. ดีขึ้นมาก
2. ดีขึ้นบ้างเล็กน้อย
3. เหมือนๆ เดิม
4. แย่ลงบ้างเล็กน้อย
5. แย่กว่ามาก

ตอนที่ 3 **ผลกระทบของสุขภาพช่องปากต่อสมรรถภาพในชีวิตประจำวัน**

เราอยากจะรู้ว่า ปาก ฟัน และฟันปลอมของท่าน มีผลต่อชีวิตประจำวันของท่านในหกเดือนที่ผ่านมาอย่างไรบ้าง? โดยเราอยากจะรู้ว่า บ่อยครั้งแค่ไหนที่ปัญหาเกี่ยวกับปาก ฟัน หรือฟันปลอม ทำให้ท่านไม่สามารถทำกิจกรรมที่จะกล่าวถึงต่อไปนี้ได้? และถ้าท่านมีปัญหาเหล่านี้ เราสนใจต่อไปว่าท่านรู้สึกว่าปัญหาที่เกิดนั้น รุนแรงเพียงใด?

Q1 a) ปัญหาจาก ปาก ฟัน หรือฟันปลอม ได้ไปจำกัดความสามารถในกิจกรรมหรือพฤติกรรมต่อไปนี้ของท่านบ้างหรือไม่?

0 ไม่มีปัญหา

\- มีปัญหา (ตอบข้อ b)

b) ถ้ามีปัญหา, ปัญหานั้นเกิดบ่อยแค่ไหน?

\- น้อยกว่า 6 ครั้ง (ตอบข้อ c)

2 เดือนละครั้ง หรือสองครั้ง

3 สัปดาห์ละครั้งหรือสองครั้ง

4 สัปดาห์ละ 3-4 ครั้ง

5 ทุกวันหรือเกือบทุกวัน หรือสัปดาห์ละ 5 ครั้งขึ้นไป

c) ถ้าน้อยกว่า 6 ครั้ง, ปัญหาที่เกิดรวมเป็นสักกี่วันโดยรวม?

1 1-5 วัน

2 6-15 วัน

3 16-30 วัน

4 1-3 เดือน

5 มากกว่า 3 เดือน

Q2 เราจะถามเกี่ยวกับความรุนแรงของปัญหาที่เกิดขึ้นต่อชีวิตประจำวันของท่าน โดยกำหนดคะแนนความรุนแรงตั้งแต่ 0 ถึง 5

โดย 5 หมายความว่า รุนแรงเต็มที่

0 หมายความว่า ไม่มีผลเลย

ปัญหาของท่านมีความรุนแรงสักเท่าใดจาก 0 ถึง 5 ในความรู้สึกของท่าน

0 1 2 3 4 5

Q3 อะไรเป็นสาเหตุหลักที่ทำให้เกิดปัญหานี้

1 ความเจ็บปวด

2 ความไม่สบาย, รำคาญ

3 การทำหน้าที่ของปากและฟัน เป็นไปได้อย่างจำกัด (เช่นความจำกัดในการเคี้ยว การกัด หรือการอ้าปากกว้าง)

4 ความไม่พอใจลักษณะที่มองเห็น, ความสวยงาม

5 อื่นๆ (ระบุ)_____

Q4 เพื่อที่จะรู้เกี่ยวกับสาเหตุที่ว่านี้ในรายละเอียด ขอให้ท่านช่วยระบุว่า สภาวะช่องปากใดที่ทำให้เกิดปัญหาที่ว่าข้างต้นนี้

(ถ้ามีมากกว่า 1 อย่าง ให้ใส่รหัสของทุกคำตอบ แล้วงกลมข้อที่ผู้ตอบเห็นว่าสำคัญมากที่สุด)

00 ไม่ทราบ

ฟัน

01 ปวดฟัน

02 การสูญเสียฟัน

03 ฟันโยก

04 สีของฟัน

05 ตำแหน่งของฟัน (เช่น ฟันเก,ฟันยื่น,ฟันห่างฯ)

06 รูปร่างหรือขนาดของฟัน

07 ฟันสึก

ปาก

08 ความผิดปกติของปากและหน้า (เช่นปากแหว่ง,เพดานโหว่ฯ)

09 แผลในช่องปาก (ที่ได้เกิดจากฟันปลอม)

10 การปวดแสบปวดร้อนในปาก

11 กลิ่นปาก

12 การรับรสผิดปกติ

13 การมีรสอันไม่พึงใจในปาก

เหงือก

14 เลือดออกจากเหงือก

15 เหงือกร่น

16 เหงือกอักเสบ

ข้อต่อขากรรไกร

17 ข้อต่อขากรรไกรลั่น, มีเสียงเมื่อขยับ

18 ข้อต่อขากรรไกรหลุด ยึดหรือล็อค

การรักษาที่เคยได้รับ

19 การอุดฟันที่ไม่ดี หรือแตกหัก

20 ฟันปลอมที่หลวมหรือไม่แน่น

21 เครื่องมือจัดฟัน

22 ฟันเป็นรู

23 โกนปูน

88 อื่นๆ (ระบุ)_____

ตารางที่ 1 (27-62)

กิจกรรม	Q_1	Q_2	Q_3	Q_4
1. การกินอาหาร หรือความพอใจในอาหาร				
2. การพูดหรือการออกเสียงให้ชัดเจน				
3. การทำความสะอาดช่องปาก (เช่น การแปรงฟัน)				
4. กิจกรรมทางร่างกายอื่นๆ (เช่น การทำความสะอาดบ้านเรือน, การทำอาหารฯ)				
5. การนอนหลับ และพักผ่อน				
6. การยิ้ม, หัวเราะ หรือโชว์ฟัน โดยไม่รู้สึกอับอาย				
7. การลงสภาพอารมณ์ตามปกติโดยไม่รู้สึกหงุดหงิด รำคาญ				
8. การทำงานหลักหรือดำเนินบทบาทหลักในชีวิตของท่าน				
9. การติดต่อกับคนอื่นๆ (เช่น ออกไปพบปะสังสรรค์กับเพื่อนฝูง)				

ตอนที่ 4 ปัจจัยทางสังคมและจิตวิทยา เกี่ยวกับแนวโน้มโดยธรรมชาติของพฤติกรรม

ตอนนี้เราอยากจะถามคำถามเกี่ยวกับสิ่งที่ท่านทำหรือคิดเกี่ยวกับฟันและปาก ไม่มีคำตอบถูกหรือผิด โปรดตอบอย่างอิสระในคำตอบที่ท่านเคยทำ หรือคิดจริงๆ

P1 a) เมื่อวานนี้ท่านมีโอกาสจะได้ทำความสะอาดช่องปากบ้างไหม? _____(63)

0 ไม่มี (ไปข้อ P2)

ถ้ามี b) ท่านได้ทำความสะอาดกี่ครั้ง?

1. 1 ครั้ง 2. 2 ครั้ง 3. มากกว่า 2 ครั้ง

c) ท่านใช้วิธีใดในการทำความสะอาดช่องปาก? _____(64)

1. แปรงฟัน
2. แปรงฟัน ร่วมกับวิธีอื่น (ระบุ)_____
3. วิธีอื่น (ระบุ) _____

P2 a) ท่านเติมน้ำตาลลงในอาหาร(เช่น ในกับข้าว, ก๋วยเตี๋ยว) บ่อยไหม?

(อ่านคำตอบ) ____(65)

1 ไม่เคยเลย

2 นานๆ ครั้ง

3 เป็นบางครั้งบางคราว

7 บ่อยๆ / เสมอๆ จำนวน ____ ____ ช้อนชา (66-67)

b) ท่านเติมน้ำตาลลงในเครื่องดื่ม(เช่น ในชา, กาแฟ) บ่อยไหม?

(อ่านคำตอบ) ____(68)

1 ไม่เคยเลย

2 นานๆ ครั้ง

3 เป็นบางครั้งบางคราว

7 บ่อยๆ / เสมอๆ จำนวน ____ ____ ช้อนชา (69-70)

c) เมื่อวานนี้ ท่านกินของหวานหรืออาหารชนิดใดที่มีรสหวานกี่ครั้ง? _____(71)

__ ครั้ง

d) ท่านได้ดื่มเครื่องดื่มที่มีรสหวาน เช่น น้ำอัดลม น้ำผลไม้ ชา/กาแฟ ใส่น้ำตาลกี่ครั้งเมื่อวานนี้ _____(72)

__ ครั้ง

P3 ทุกวันนี้ท่านสูบบุหรี่อยู่หรือเปล่า?

a) ถ้าไม่, ท่านเคยสูบบุหรี่เป็นประจำมาก่อนหรือเปล่า _____(73)

1. ไม่เคย

2. เคยสูบ แต่เลิกแล้ว

3. ทุกวันนี้ยังสูบอยู่

b) ถ้าทุกวันนี้ยังสูบอยู่,

ท่านสูบบุหรี่มวนแบบซอง หรือ บุหรี่ชนิดมวนยาสูบเอง?

b.1) ถ้าสูบบุหรี่มวนแบบซอง

- ท่านสูบกี่มวน/วัน __ __ มวน (74-75)

b.2) ถ้าสูบบุหรี่ชนิดมวนยาสูบเอง, ท่านใช้ใบยาสูบประมาณสักกี่กรัมต่อสัปดาห์

____ กรัม (76)

P4 a) ท่านไปพบหมอฟันหรือทันตาภิบาลครั้งสุดท้าย เมื่อใด? _____(77)

0 ไม่เคยเลย

1 มากกว่า 20 ปีมาแล้ว

2 10+-20 ปีมาแล้ว

3 5+-10 ปีมาแล้ว

4 2+-5 ปีมาแล้ว

5 1-2 ปีมาแล้ว

6 น้อยกว่า 1 ปีมาแล้ว

b) ใน 2 ปีที่ผ่านมาท่านไปพบหมอฟันกี่ครั้ง (78-79)

0 ไม่เคย

__ __ ครั้ง

c) ถ้าเคย, ท่านไปพบหมอฟันด้วยสาเหตุอะไร? (ตรวจสอบดู อาจมีคำตอบมากกว่า 1)

1 ตรวจฟัน หรือไปเพื่อจุดประสงค์ในการป้องกัน 1 ใช่ 2 ไม่ใช่ (80)

2 ไปด้วยอาการของช่องปากระยะเริ่มแรก 1 ใช่ 2 ไม่ใช่ (81)
(เช่น เมื่อเริ่มสังเกตเห็นลักษณะผิดปกติในช่องปาก
หรือเพิ่งจะมีอาการเสียวหรือเจ็บเล็กน้อย)

3. ไปด้วยอาการของช่องปากระยะรุนแรง 1 ใช่ 2 ไม่ใช่ (82)
(เช่น เมื่อมีอาการปวดรุนแรง หรือเกิดการบวมอักเสบ
หรือเมื่อทนความไม่สะดวกสบายที่เกิดมานานไม่ไหว)

4. ไปตามที่หมอนัด 1 ใช่ 2 ไม่ใช่ (83)

5. อื่นๆ (ระบุ)_____ 1 ใช่ 2 ไม่ใช่ (84)

P5 ท่านจัดตัวท่านเองว่าตัวท่านเป็นคนที่ (อ่านคำตอบ) ____(85)

1 ได้รับความลำบากจากปากและฟันมาก

2 ได้รับความลำบากจากปากและฟันอยู่พอควร

3 ไม่ค่อยจะได้รับความลำบากจากปากและฟันเลย

P6 ท่านคิดว่าการทำฟัน (การรักษาทางทันตกรรม) สามารถช่วยให้ปากและฟันของท่านมีสุขภาพดีขึ้นไหม? (ตรวจสอบดู เช่น จากความเชื่อเรื่องทำฟันแล้วเสียประสาทด้วย) ____(86)

1 ดีขึ้น/แน่นอน

2 อาจจะ/เป็นบางครั้ง/ไม่แน่ใจ

3 ไม่ดีขึ้น

4 ไม่ทราบ

P7 เราอยากจะถามท่านบางคำถามเกี่ยวกับความรู้สึกของท่านในการไปหาหมอฟัน บางคนอาจจะหวาดกลัว บางคนกระวนกระวายเล็กน้อย ขณะที่บางคนอาจไม่กังวลอะไรเลย

ท่านรู้สึกอย่างไร? (อ่านคำตอบ) _____(87)

1 กลัวจริงๆ

2 กังวลพอควร

3 กังวลเล็กน้อย

4 ไม่กังวลเลย

P8 a) ถ้าท่านมีปัญหาในช่องปาก ท่านจะไปหาหมอฟันหรือไม่? (ตรวจสอบดู) _____(88)

1 แน่นอน

2 อาจจะ/ไม่แน่ใจ

3 ไม่ไป

b) ถ้าไม่ไป, อะไรเป็นความลำบากสำหรับท่านในการไปหาหมอฟัน หรือหมอสุขภาพช่องปาก?

(ตรวจสอบ, อาจมีมากกว่า 1 คำตอบ)

b1 ความกลัว 1 ใช่ 2 ไม่ใช่ (89)

b2 ค่าใช้จ่าย 1 ใช่ 2 ไม่ใช่ (90)

b3 ปัญหาด้านเวลา 1 ใช่ 2 ไม่ใช่ (91)

b4 ความห่างไกล หรือการขาดแคลนของสถานบริการ 1 ใช่ 2 ไม่ใช่ (92)

b5 ขาดความเชื่อมั่นในความสามารถทันตบุคลากร 1 ใช่ 2 ไม่ใช่ (93)

b6 ขาดความเชื่อมั่นในผลที่จะได้จากการรักษาทางทันตกรรม 1 ใช่ 2 ไม่ใช่ (94)

b7 ความไม่พึงพอใจในการบริการทันตกรรมที่เคยได้รับมา 1 ใช่ 2 ไม่ใช่ (95)

b8 อื่นๆ (ระบุ)_____ 1 ใช่ 2 ไม่ใช่ (96)

P9 หมอฟันหรือทันตาภิบาล หรือเจ้าหน้าที่สาธารณสุขหรือ อสม. เคยสาธิตเกี่ยวกับการทำความสะอาดช่องปากแก่ท่าน บ้างหรือไม่? _____(97)

0 ไม่ (ไปข้อ P12)

b ถ้าเคย เขาแนะนำอะไรบ้าง?

1 จำไม่ได้/ไม่แน่ใจ (ไปข้อ P12)

c ถ้าจำและอธิบายได้ ท่านได้ทำตามคำแนะนำนั้นไหม?

2 ไม่ได้ทำตามเลย

3 ทำตามอยู่บ้าง

4 ทำตามทั้งหมด

P10 หมอหรือเจ้าหน้าที่สาธารณสุขหรือ อสม.ได้เคยให้คำแนะนำท่านในหัวข้อต่อไปนี้บ้างหรือไม่? (ถามรายหัวข้อ)

- ถ้าไม่ ใส่รหัส 0 แล้วถามว่า

ก. ท่านเคยได้รับคำแนะนำเกี่ยวกับเรื่องใดบ้าง?

(เลือก 1 หัวข้อเกี่ยวกับการดูแลสุขภาพตนเอง และ 1 หัวข้อเกี่ยวกับการใช้ยาหรือการรักษาทางการแพทย์) แล้วถามข้อ ข.

- ถ้าเคย : ข. ท่านได้ทำตามคำแนะนำนั้นหรือไม่?

รหัส 1 ไม่เลย

2 ทำตามบางส่วน

3 ทำตามทั้งหมด

a) การดูแลสุขภาพตนเอง

	คำตอบ	
a1) ด้านอาหาร เช่น การลดไขมัน/เกลือ/น้ำตาล หรือการหลีกเลี่ยงอาหารดิบ	0 1 2 3	(98)
a2) การลดการสูบบุหรี่	0 1 2 3	(99)
a3) อื่นๆ (ระบุ)_____	0 1 2 3	(100)

b) การรักษาทางการแพทย์

b1) การใช้ยา	0 1 2 3	(101)
b2) การนัดไปตรวจ	0 1 2 3	(102)
b3) อื่นๆ (ระบุ)_____	0 1 2 3	(103)

ขอบคุณในความร่วมมือของท่าน

เวลาสิ้นสุดการสอบถาม __:__

เวลาที่ใช้ในการสอบถาม ____ นาที (104-105)

หมายเหตุ การนัดตรวจ_____

_____

_____

_____

APPENDIX 3

Oral Examination Form

and the Manual

ORAL HEALTH ASSESSMENT FORM (1995)

Study of Integrating Socio-Behavioral factors in Dental Treatment Need Estimation

Department of Epidemiology and Public Health, University College London.

DATE ☐☐ y ☐☐ m Examiner ☐ Duplication ☐ Study ID_____ (7-10)

Area_____ Ward_____ Location ☐☐ (11-12)

DENTITION STATUS AND TREATMENT NEED

55 54 53 52 51 61 62 63 64 65

18 17 16 15 14 13 12 11 21 22 23 24 25 26 27 28

status

(13) (28)

(29) (44)

treatment

85 84 83 82 51 71 72 73 74 75

48 47 46 45 44 43 42 41 31 32 33 34 35 36 37 38

status

(45) (60)

(61) (76)

treatment

STATUS Permanent Teeth	TREATMENT Primary Teeth
0 = sound	A 0 = none
1 = decayed	B 1 = caries arresting
2 = filled & decayed	C
3 = filled, no decay	D 2 = one surface filling
4 = missing due caries	E 3 = two or more surface fillings
5 = missing any other reason	- 4 = crown or bridge
6 = bridge abutment or special crown	F abutment
8 = unerupted tooth	5 = bridge element
9 = excluded tooth	G 6 = pulp care
	- 7 = extraction
	- 8 = need for other care
	9 = excluded tooth

ORAL MUCOSA & BONE LESION ☐ (77)

Specify_____

_____

PLAQUE 16 11 26 — (78) (80) R (81) (83) — 46 31 36

CALCULUS 16 11 26 — (84) (86) (87) (89) — 46 31 36

POCKET DEPTH 16 11 26 — (90) (92) (93) (95) — 46 31 36

BLEEDING 16 11 26 — (96) (98) L (99) (101) — 46 31 36

DENTURE STATUS upper lower (102) ☐☐ (103)

0 = no denture
1 = partial denture wearing
2 = full denture, wearing
3 = partial denture, not wearing
4 = full denture, not wearing

NEED FOR DENTURES upper lower (104) ☐☐ (105)

0 = no denture needed
1 = need for full denture
2 = need for partial denture
3 = need to repair full denture
4 = need to repair partial denture

BRIDGE STATUS upper lower (106) ☐☐ (107)

0 = no bridge
1 = 1 bridge
2 = 2 or more bridges

NEED FOR BRIDGE upper lower (108) ☐☐ (109)

0 = no bridge needed
1 = 1 new bridge
2 = 2 or more new bridges
3 = 1 replacement bridge
4 = 2 or more replacement bridges

ENAMEL DISORDERS

Status ☐ (110) (111)

0 = none
1 = opacities
2 = hypoplasia
3 = tetracycline
4 = fluorosis

Treatment Need number of teeth affected ☐☐ (112) 0 = no 1 = yes ☐ (113)

MALOCCLUSION

0 = none
1 = slight ☐ (114)
2 = moderate or severe

TMJ. ASSESSMENT

0 = normal
1 = clicking ☐ (119)
2 = self-correcting blocking
3 = dislocation of TMJ.
4 = pain related to TMJ.

NEED FOR IMMEDIATE CARE

life threatening condition ☐ (116)

jaw/fracture ☐ (117)

pain or infection ☐ (118)

other ☐ (119)_____

MANUAL OF ORAL EXAMINATION FORM

An integrated socio-dental approach

to dental treatment need estimation

Department of Epidemiology and Public Health,

University College London.

1. Identification section (1-12)

1.1 Date (1-4) : The numbers of the year, and month at the time of examination.

1.2 Examiner (5) : Identification number of examiners.

1.3 Duplication (6) : Original or first examination = 1

Duplicated examination = 2

1.4 Study ID. (7-10) : Identification number of each subject, have to be the same number as in questionnaire.

1.5 Location (11-12) : Identification number of the study village.

2. Dentition status and treatment need (13-76)

2.1 Dentition status

Criteria for diagnosis

Code	*Description*
0	-Sound tooth; no evidence of treated or untreated clinical caries, included: white or chalky spots, stained or discoloured pit or surface.
1	-Decayed tooth; a lesion with detectably softened floor or wall, undermined enamel, temporary filling.
2	-Filled tooth with decay; permanent restoration with primary or secondary caries.
3	-Filled tooth with no decay; permanent restoration without primary or secondary caries, crown from previous decay.
4	-Tooth missing due to caries; absent of tooth due to caries, distinguish by clues from history of previous tooth decayed.
5	-Tooth missing due to any other reason; absent of tooth due to any other reasons eg. congenital absent, trauma, periodontal disease, extraction from prosthetic or orthodontic reason.
6	-Bridge abutment or crown; part of fixed bridge, crown from reasons other than caries.
7	-Unerupted teeth; congenital unerupted tooth.
9	-Excluded tooth; tooth that cannot be examined.

2.2 Treatment of teeth

Criteria for diagnosis

Code	*Description*
0	-None; no treatment required.
1	-Caries-arresting; remineralized lesion with no treatment required.
2	-One surface filling; one surface filling required due to caries, trauma, discolouration, developmental defect or unsatisfactory filling.
3	-Two or more surface fillings; included separate or compound fillings or proximal filling involving occlusal opening.
4	-Crown or bridge abutment; crown required in case of large carious lesion or loss of majority of tooth crown without pulp involvement.
5	-Bridge element; pontic of bridge replacing a missing tooth.
6	-Pulp care; pulp treatment probably required prior to restoration or crown.
7	-Extraction; tooth extraction required due to: loss of crown that cannot be restored, retained root, severe loose or functionless, impaction, prosthetic or orthodontic reason.
8	-Need for other care (specify).
9	-Excluded tooth; tooth that cannot be examined.

3. Oral mucosa and bone lesion (77)

Code	*Description*
0	-Normal
1	-Lesion found (specified type or characteristics of the lesion according to clinical diagnostic criteria)

4. Plaque (78-83)

The explorer is place on the index surfaces as follows;

16 -Buccal

11 -Labial

26 -Buccal

36 -Lingual

31 -Labial

36 -Lingual

In case of index molar is absent or crowned, the second molar, then third molar, second premolar will be examined instead respectively. If those are also absent, score 9 is used.

If the anterior index tooth is absent or crowned, nearby central incisor, lateral incisors, or molars will be examined instead respectively.

Criteria

Score	*Description*
0	No plaque present
1	Plaque detected between gingival margin and lowest 1/3 of the tooth surface
2	Plaque detected between lowest 1/3 to 2/3 of the tooth surface
3	Plaque detected in top 1/3 of the tooth surface

Periodontal condition

Calculus, pocket depth, and bleeding of gingiva are assessed independently. WHO 621 Periodontal probe is used to examined index teeth as follows;

16, 17

11

26, 27

36, 37

31

46, 47

The probe is gently placed in the gingival sulcus and moved gently up and down through the sulcus in the disto-mesial direction, of both buccal and lingual surfaces. The highest score will be recorded. In case of absence of index teeth, the criteria mentioned under 'plaque' will be used for replacement. If there are not at least two teeth remaining and not indicated for extraction in a sextant, scored 9 is used.

5. Calculus (84-89)

Code	*Description*
0	No calculus present
1	Calculus present
9	Assessment not possible

NB. Very small particles of calculus, sensed as little irregularities at the surface of the tooth, or stain, are coded as 0.

6. Pocket depth (90-95)

Code	*Description*
0	Pocket depth less than 3 mm.
1	Pocket depth between 4-5 mm. (gingival margin situated on black area of probe)
2	Pocket depth more than 6 mm. (black area of probe not visible)
9	Assessment not possible

NB. A pseudo pocket coded as 0.

7. Gingival bleeding (96-101)

Code	*Description*
0	No bleeding
1	Bleeding observed, directly after sensing or after completion of examination in either upper or lower jaw.
9	Assessment not possible.

8. Denture status (102-103)

Code	*Description*
0	-No denture- dentition is complete or examinee claims not to possess and never to have possessed a denture.
1	-Partial denture, wearing
2	-Full denture, wearing
3	-Partial denture, not wearing (examinee claims to possess a prosthesis, but is not in evidence)
4	-Full denture, not wearing

9. Need for denture (104-105)

Code	*Description*
0	-No denture needed -either because of a completely or satisfactorily intact dentition or the denture is worn and satisfactory.
1	-Need for full denture -either from edentulous, full clearance require or the denture being worn is unsatisfactory (in term of function, design, tissue damage, poor fit, unsatisfactory occlusion, or aesthetics). Code 4 in denture status also qualifies.
2	-Need for partial denture -either from insufficient dentition (after considering bridge alternative) or the denture being worn is unsatisfactory. Code 2 in denture status also qualifies.
3	-Need to repair full denture -need repair due to a crack, a missing piece or need for reline.
4	-Need to repair partial denture -need repair due to crack, a missing piece, need for extension, need for reline, aesthetic inadequacy.

10. Bridge status (106-107)

Code	*Description*
0	-No bridge
1	-One bridge
2	-Two or more bridges

11. Need for bridge (108-109)

Code	*Description*
0	-No bridge needed
1	-One new bridge needed
2	-2 or more new bridges needed
3	-One replacement bridge needed
4	-2 or more bridges needed

NB: Basic clinical judgements based on prognosis of abutments should be applied e.g. mobility, attachment loss, position or supporting structure and space ratio.

12. Enamel disorders (110-113)

12.1 Enamel status (110)

Code	*Description*
0	-None; -no opacities or enamel disorder
1	-Opacities (usually oval in form, not translucent, unsymmetrical, seldom found on more than one or two teeth)
2	-Hypoplasia
3	-Tetracyclines stain
4	-Fluorosis (usually show a horizontal striated pattern across the tooth, bilaterally symmetrical, range from slight white flecks to severe pitted and worn areas with brown stains)

12.2 Number of teeth affected (111-112)

Recording number of teeth affected by the conditions above eg. if there are six teeth with hypoplasia, the recording is 06.

12.3 Treatment need (113)

Code	*Description*
0	-No treatment needed.
1	-Treatment needed for aesthetic purposes or due to structural defects.

13 Malocclusion (114)

Code	*Description*
0	No malocclusion or anomaly
1	Slight anomalies, such as one or more rotated or tilted teeth or slight crowding or spacing, which disturb the regular alignment of the teeth
2	More serious anomalies, specifically, the presence of one or more of the following conditions of the four anterior incisors; -maxillary overjet estimated to be 9 mm or more, -mandibular overjet, anterior cross bite equal to or greater than a full tooth depth, -open bite, -midline shift estimated to be more than 4 mm, -crowding or spacing estimated to be more than 4 mm.

14. Temporo-mandibular joint assessment (115)

Code	*Description*
0	Normal TMJ functions without pain, sounds or other signs of dysfunction
1	Clicking. TMJ functions without pain, or other signs of dysfunction, but clicking is heard on opening and closing
2	Self-correcting blocking. TMJ occasionally dislocates but relocates with out professional care
3	Dislocation of TMJ. There is spontaneous dislocation that requires professional care
4	Pain related to TMJ. There is pain in the TMJ area or elsewhere in the head neck, or shoulder region related to joint dysfunction

15. Conditions needing immediate care (116-119)

There is a need for immediate care if pain, infection or serious illness will result unless treatment is provided within a certain period of time, such as; oral cancer or precancerous lesions (116), fracture of the jaw (117), periapical abscess, acute necrotizing ulcerative gingivitis, gross caries (118).

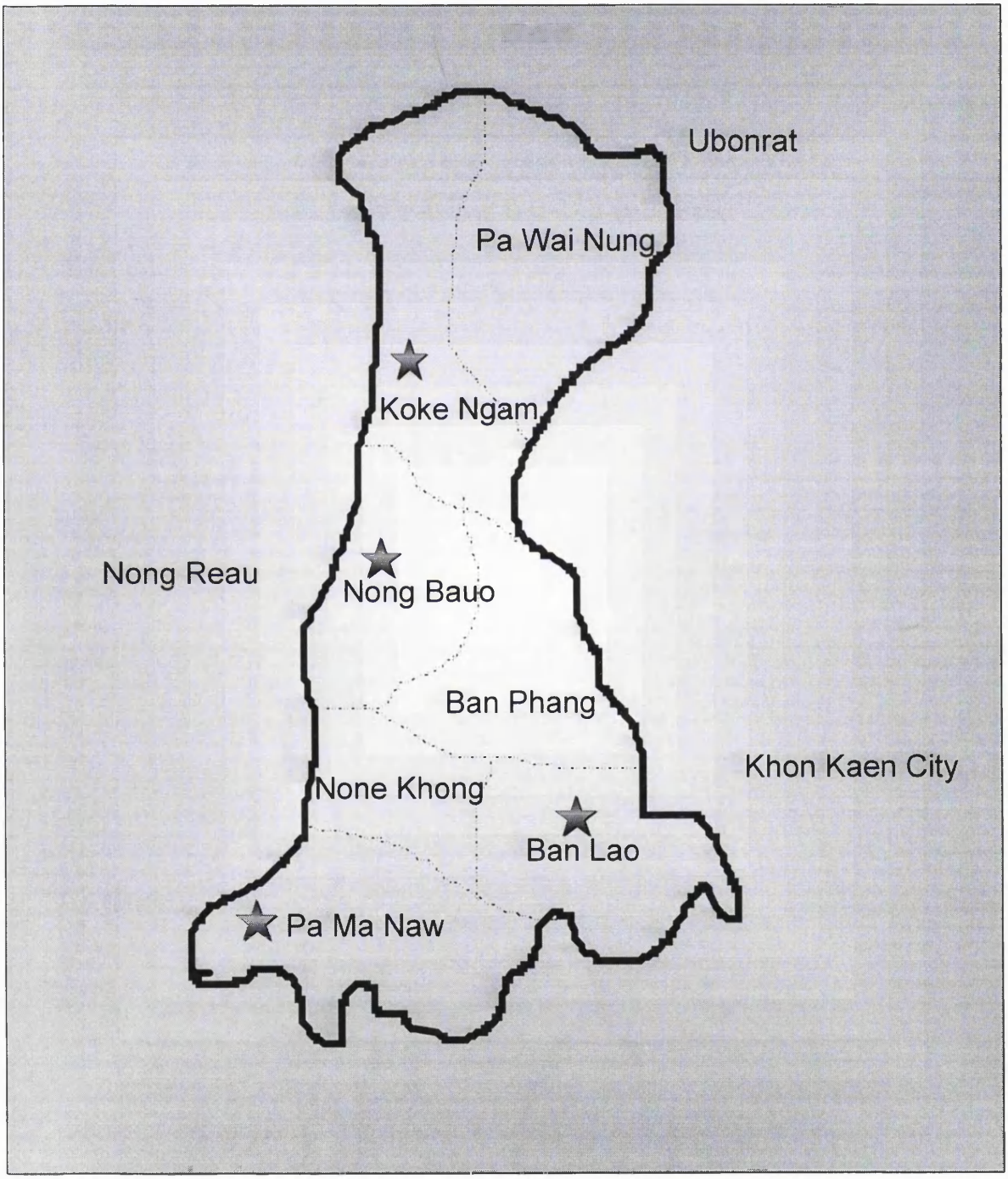
Several recording may be made independently in 116-119 when more than one condition require immediate attention is present.

APPENDIX 4

Map of Ban Phang District,

Khon Kaen, Thailand

Map of Ban Phang District,
Khon Kaen, Thailand



★ **Subdistrict sample**

APPENDIX 5

Frequency distributions of major oral health status

Frequency distribution of major oral health status

Table AP5.1 Frequency distribution of number of decayed, missing, filled and sound teeth *(n=501)*

Number of teeth	Decayed		Missing		Filled		Number of teeth	Sound	
	n	%	n	%	n	%		n	%
0	282	56.3	217	43.3	492	98.2	32	131	26.1
1	104	20.8	83	16.6	6	1.2	31	78	15.6
2	42	8.4	70	14.0	1	0.2	30	72	14.4
3	29	5.8	45	9.0	1	0.2	29	62	12.4
4	18	3.6	43	8.6	1	0.2	28	57	11.4
5	10	2.0	16	3.2	0	0.0	27	21	4.2
6	5	1.0	14	2.8	0	0.0	26	25	5.0
7	4	0.8	4	0.8	0	0.0	25	19	3.8
8+	7	1.4	9	1.8	0	0.0	24-	36	7.2

Table AP5.2 Frequency distribution of number of sextant with calculus, bleeding, shallow and deep periodontal pockets *(n=501)*

Number of sextant	Calculus		Bleeding		Shallow pockets		Deep pockets	
	n	%	n	%	n	%	n	%
0	8	1.6	15	3.0	49	9.8	394	78.6
1	6	1.2	12	2.4	52	10.4	52	10.4
2	6	1.2	17	3.4	80	16.0	26	5.2
3	17	3.4	32	6.4	72	14.4	11	2.2
4	11	2.2	36	7.2	89	17.8	8	1.6
5	40	8.0	70	14.0	90	18.0	6	1.2
6	413	82.4	319	63.7	69	13.8	4	0.8

APPENDIX 6

Hierarchical regression

to compare frequency, severity, and OIDP score

Hierarchical regression to compare frequency, severity, and OIDP score

1. Multiple regression which DMFT is the dependent variable

1.1 The first step, frequency and severity scores are put into the model

Multiple R	0.3030
R Square	0.0918
Adjusted R Square	0.0881
Standard Error	2.9164

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	2	428.08646	214.04323
Residual	498	4235.71394	8.50545

F = 25.1654 Significant F < 0.0001

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
Frequency	0.0937	0.0436	0.1466	2.149	0.03
Severity	0.0818	0.0320	0.1744	2.557	0.01
(Constant)	1.7747	0.1863		9.528	<0.0001

1.2 The second step, frequency, severity and OIDP scores are put into the model

Multiple R	0.3088
R Square	0.0954
Adjusted R Square	0.0899
Standard Error	2.9136

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	3	444.8198	148.2733
Residual	497	4218.9807	8.4889

F = 17.4667 Significant F < 0.0001

---------- Variables in the Equation ----------

Variable	*B*	*SE B*	*Beta*	*T*	*Sig T*
Frequency	0.0099	0.0740	0.0154	0.133	0.89
Severity	0.0427	0.0424	0.0911	1.007	0.31
OIDP	*0.0758*	0.0540	0.2117	1.404	0.16
(Constant)	1.8588	0.1955		9.509	>0.0001

1.3 Comparison of the residuals of step 1 and step 2

$$F = \frac{(\text{residual 1 - residual 2})/(\text{df 1-df 2})}{\text{residual 1/df 1}}$$

$$= \frac{(4235.7139 - 4218.9807)/(498-497)}{4235.7129/498}$$

$$= 1.97 \quad (p>0.05)$$

2. Multiple regression which number of sextant with deep periodontal pockets is the dependent variable

2.1 The first step, frequency and severity score are put into the model

Multiple R	0.2040
R Square	0.0416
Adjusted R Square	0.0378
Standard Error	1.0544

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	2	24.0480	12.0240
Residual	498	553.6925	1.1118

F = 10.8146 Significant F <0.0001

---------- Variables in the Equation ----------

Variable	*B*	*SE B*	*Beta*	*T*	*Sig T*
Frequency	0.0313	0.0158	0.1396	1.987	0.05
Severity	0.0125	0.0116	0.0759	1.083	0.28
(Constant)	0.2231	0.0673		3.314	0.001

2.2 The second step, frequency, severity and OIDP scores are put into the model

Multiple R	0.2431
R Square	0.0591
Adjusted R Square	0.0534
Standard Error	1.0458

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	3	34.14443	11.38148
Residual	497	543.59609	1.09375

F = 10.4058 Significant F < 0.0001

---------- Variables in the Equation ----------

Variable	*B*	*SE B*	*Beta*	*T*	*Sig T*
Frequency	-0.0338	0.0265	-0.1502	-1.274	0.20
Severity	- 0.0178	0.0152	-0.1082	-1.173	0.24
OIDP	*0.0589*	0.0194	0.4672	3.038	0.003
(Constant)	0.2885	0.0702		4.111	>0.0001

2.3 Comparison of the residuals of step 1 and step 2

$$F = \frac{(\text{residual 1} - \text{residual 2})/(\text{df 1} - \text{df 2})}{\text{residual 1/df 1}}$$

$$= \frac{(553.6925 - 543.5961)/(498-497)}{(553.6925/498)}$$

$$= 9.10 \quad (p>0.05)$$

APPENDIX 7

Paper 1 : Oral impacts affecting daily performances in a low dental disease Thai population

Community Dentistry and Oral Epidemiology (In Press)

TITLE PAGE

Full title: ORAL IMPACTS AFFECTING DAILY PERFORMANCE IN A LOW DENTAL DISEASE THAI POPULATION

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Running title: Oral impacts in a low disease population

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ORAL IMPACTS AFFECTING DAILY PERFORMANCES IN A LOW DENTAL DISEASE THAI POPULATION

Traditionally, oral health outcomes have been conceptualized in terms of clinical indicators of oral health status or measures of oral pathology. Recently, more attention has been given to consideration of how oral conditions affect quality of life in general. The scope of subjective indices, therefore, has been widely extended to cover physical, psychological and social aspects of daily functioning .

Apart from mortality, which is a rare outcome of dental disease, most socio-dental studies focus upon a numbers of outcomes. Some studies centred on a single outcome. Pain was the single major concern in some studies (1-5). Satisfaction with appearance was also a key outcome in many studies relating to aesthetics and the social aspects in dentistry (6-10). While functional outcomes have been measured mainly as chewing ability (11, 12).

Several socio-dental indicators developed from theoretical frameworks, such as role theory (13), Parsons' sick role model (14), and the concepts of disability and handicap (15) have been applied to oral health by Locker (16). Numerous measures were included to assess the consequences of oral health (17-27). Some of these subjective measurements have been developed into scoring systems to be composite socio-dental indices such as The Geriatric Oral Health Assessment (GOHAI) (23), the Dental Impact on Daily Living (DIDL) (24, 25), the Oral health Impact Profile (OHIP) (26, 27). However, most studies were done on people in industrialized countries where dental diseases prevalence was high.

Single variable measurements present a limited view of outcome. But composite indices, which cover wider ranges of outcomes, are also too long and time consuming for

large population surveys. What is more, they overscore by counting the same impacts more than once. Therefore, alternative measures for coping with the problems should be developed. The current study aimed to measure incidence of the oral impact on the ability to perform daily activities and their related features, in a low disease adult population in Thailand, using a new measure of impact. The measures focus on translating impact dimensions into impacts on 'the ability to perform daily activities', or 'daily performances'. Their theoretical framework was partly based on role theory suggested by Nikias et al (13) and Reisine (14). The measures also derive from the endpoint outcomes, disability and handicap in the WHO International Classification of Impairments, Disabilities and Handicaps (15). This alternative oral outcome measurement is more concise than the DIDL and OHIP, but can be used as the endpoint outcome of oral health on quality of life.

Material and methods

The questionnaire to measure oral impacts on daily performances included nine physical, psychological and social aspects of daily performances representing major variables from various socio-medical and socio-dental indicators to cover content validity. These were eating and enjoying food, speaking clearly, cleaning teeth, carrying out light physical activities, sleeping and relaxing, smiling laughing and showing teeth without embarrassment, maintaining emotional state, carrying out major work or role, and enjoyment of contact with other people. Subjects were asked whether their teeth, mouth or denture restricted their ability in any of the nine performances in the last six months. If the answer for a performance was "yes", further questions were asked about frequency, severity, perceived causal symptom and perceived physical cause of the impact.

Frequency scores was designed in a more numerical manner than normal order ranking (Table 1). The criteria use the estimated description in terms of both frequency and period over which the impact affected them. Respondents were asked about the duration or spell of the impact only when the frequency was less than once a month. Severity was assessed by asking them to rate the score, ranging from 0 to 5, as an indication of the impact's severity on their daily living; 5 represents "extreme" and 0 represents "none".

Cluster random sampling method was applied to select the representative sample from Ban Phang district, Khon Kaen, Thailand. Four of the seven subdistricts were selected according to geographical distribution. Two villages from each sample subdistrict were randomly sampled. 28 to 35 subjects per study village were randomly selected. Finally, 524 subjects from 16 villages were recruited for interviewing. However, only 501 subjects had both interviews and oral examinations. The main reason why subjects were not available for oral examination was work constraints. Interviews were performed at the subject's house by a Thai interviewer. The interview data also incorporated personal demographic information and oral health behaviours. An oral examination was done after the interview, by one dental examiner. Replicate examinations were done on 41 subjects (8.2%). The Kappa statistic of intra-examiner reliability of periodontal conditions ranged from 0.55 to 1.0, and of caries status ranged from 0.61 to 0.75,which were at fair to excellent levels of agreement.

Results

The majority of the subjects were farmers and labourers with a low education level. 76.8% worked in agriculture and 8.6% were non-skilled labourers. The highest education level of 86% of subjects was grade 4. The sample was predominantly female (65.3%), and were

almost all married (92.8%).

Oral health status and related behaviours - This was a low caries and low dental services utilization population (Table 2). The mean DMFT was 2.7 teeth, of which only 0.03 were filled. 58% had never visited a dentist in their lives.

Incidence, frequency and severity of oral impacts on daily performances are presented in Table 3. 73.6 % of all subjects had at least one daily performance affected by an oral impact during the past 6 months. The highest incidence of affected performances were Eating (49.7%), Emotional stability (46.5%), and Smiling (26.1%). While the high frequencies (or long duration) impacts affected Eating (3.3) and Speaking (3.1) performances, the severity scores were high for Sleeping (4.3), Physical activities (3.7), and both the social performances; work or major role (3.4) and enjoyment of contact with other people (3.5).

Subjects with a performance affected were asked what symptoms caused the change in performance and the condition which caused the symptom. Pain and discomfort were the main causal symptoms of impacts (40.1 %), for almost every daily performance, except Smiling (Table 4). Toothache was the major causal impairment (32.7 %) for almost all aspects of performance (Table 4).

Discussion

Even though the study focused on only the end points of outcome measures and the study subjects were a low caries population, the incidence of oral impacts was high. The incidence of 73.6 percent was similar to that found in studies in industrialized, high dental disease populations in measures of multiple subjective oral impacts were used. (17, 19, 21).

Cushing et al (17) found that 71 percent of factory workers in England aged 16-60 years had at least one oral impact. Locker (19) reported that 30.5 percent of Canadian adults aged 50 years and over had chewing limitation, 37.2 percent pain, and 67.5 percent had one or more other oral symptoms. The incidence in the 30-49 years group from the same study were 4.8, 36.7 and 51.8 percent, respectively (21). The high incidence of oral impacts in the current study was similar to that found in a study to assess community health problems and felt needs in other districts of Khon Kaen (28). In that study, oral diseases was perceived as one of the five main health problems.

It could be noted that the incidence of oral impacts affecting Eating, Emotional stability or Cleaning teeth had a 'chronic' nature, characterized by the high frequency, but the severity was low. Interestingly, performances which were seldom affected, such as Physical activities, Major role activity or Sleeping, tended to cause more 'acute' effects with low frequency, but high severity (Table 3). The results showed that frequency and severity presented the paradoxical effect on different performances. Therefore, these two measures should not be used interchangeably in oral impact measurements. Both of them, in turn, should be taken into account for the overall impact estimation.

The oral impacts on daily performances were mainly induced by pain and discomfort. The very low proportion (5.6 %) of functional limitation perceived as the causal symptom of the impacts was very similar to the 4.8 % with limitation in chewing and 6.0% with problems in speaking, in a study in 30-49 year old Canadian (21). Even in this low caries population, 32.7% of subjects said toothache was a cause of their oral problem. However, these perceived physical causes were lay people's judgements which might be different from clinicians. Toothache, for example, might include oral impairments from

either dental caries, periodontal disease, or other oral conditions, which the subjects were not capable of differentiating.

Even though this study, which was done in one rural district in Thailand, may not be generalizable, the finding that this low caries population had as high an incidence of oral impacts as industrialized population with high dental disease levels, provides more evidence of the complexity of people's perception about oral disorders. It also stresses the shortcoming of using only universal normative judgements to estimate dental needs of populations. Cross-cultural studies of oral impacts and integrating subjective measures into dental need estimation are required to broaden our concepts of oral health.

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References :

1. Miller J, Swallow JN. Dental pain and health. *Public Health (London)*, 1970; 85: 6-50.

2. Miller J, Elwood PC, Swallow JN. Dental pain: an incidence study. *Br Dent J* 1975; 139:327-8.

3. Locker D, Grushka M. Prevalence of oral and facial pain and discomfort: preliminary results of a mail survey. *Community Dent & Oral Epidemiol* 1987; 15: 169-72.

4. Locker D, Grushka M. The impact of dental and facial pain. *J Dent Res* 1987; 66: 1414-17.

5. Jaafar N, Razak IA, Zain RB. The social impact of oral and facial pain in an industrial population. *Ann Acd Med Singapore* 1989; 18(5): 553-5.

6. Secord PF, Beckman CW. Malocclusion and psychological factors. *JADA* 1959; 59: 931-8.

7. Linn EI. Social meanings of dental appearance. *J Health & Human Behav* 1966; 7: 289-95.

8. Schroeder C. An evaluation of long-term benefits of dental treatment for dento-facial handicapped children in Colorado. *JADA* 1972; 50: 17-20.

9. Helm S, Kreiborg S, Solow B. Psychosocial implications of malocclusion: A 15-year follow-up study in 30-year-old Danes. *Am J Orthodont* 1985; 87(2): 110-8.

10. Soderfeldt B, Palmqvist S, Arnbjerg D. Factors affecting attitudes toward dental appearance and dental function in a Swedish population aged 45-69 years. *Community Dent Health* 1993; 10(2): 123-30.

11. Helkimo E, Carlsson GE, Helkimo M. Chewing efficiency and state of dentition. *Acta Odont Scand* 1977; 36: 33-41.

12. Leake J. An index of chewing ability. *J Public Health Dent* 1990; 50: 262-7.

13. Nikias GM. Oral disease and the quality of life. *Am J Public Health* 1985; 775: 11-2.

14. Reisine ST. Theoretical considerations in formulating sociodental indicators. *Soc Sci & Med* 1981; 15A: 745-50.

15. Wood PHN. Appreciating the consequences of disease: the international classification of impairments, disabilities, and handicaps. *WHO Chronicle* 1980; 34: 376-80.

16. Locker D. Measuring oral health : A conceptual framework. *Community Dent Health*

1988; 5: 3-18.

17. Cushing AM, Sheiham A, Maizels J. Developing socio-dental indicators-the social impact of dental disease. *Community Dent Health* 1985; 3: 3-17.

18. Rosenberg D, Kaplan S, Senie R, Badner V. Relationships among dental functional status, clinical dental measures, and generic health measures. *J Dent Educ* 1988; 52 (11): 653-57.

19. Locker D. The burden of oral disorders in a population of older adults. *Community Dent Health* 1992; 9: 109-24.

20. Hollister MC, Weintraub JA. The association of oral status with systematic health, quality of life, and economic productivity. *J Dent Educ* 1993; 57(12): 901-12.

21. Locker D, Miller Y. Evaluation of subjective oral health status indicators. *Journal of Public Health Dent* 1994; 54(3): 167-76.

22. Rosenoer LM, Sheiham A. Dental impacts on daily life and satisfaction with teeth in relation to dental status in adults, *J Oral Rehabil* 1995; 22: 469-80.

23. Atchison K, Dolan T. Development of the geriatricoral health index. *J Dent Educ* 1990; 54: 680-7.

24. Leao ATT, Sheiham A. The development of socio-dental measures of dental impacts on daily living. *Community Dent Health* 1995; 13: 22-6.

25. Leao ATT, Sheiham A. Relationship between clinical dental status and subjective impacts on daily living. *J Dent Res* 1995; 74(7): 1408-13.

26. Slade GD, Spencer AJ. Development and evaluation of the Oral Health Impact Profile. *Community Dent Health* 1994; 11: 3-11.

27. Locker D, Slade G. Oral health and the quality of life among older adults: the oral health impact profile. *J Can Dent Assoc* 1993; 59(10): 830-44.

28. Na Nakorn S, Grisanaphuti W, Khammeng T, Ratanasiri A. *An assessment of communities health problems and felt needs in Khon Kaen, Thailand : A parcipatory action research (Research report)*, Khon Kaen University Press, Khon Kaen, 1993; 196-216.

Table 1 Criteria of frequency score of impaired performances

Category	Score
Never	0
Less than once a month and a spell up to 5 days in total	1
Once or twice a month, or a spell up to 15 days in total	2
Once or twice a week, or a spell up to 30 days in total	3
3-4 times a week, or a spell up to 3 months in total	4
Every or nearly every day, or a spell over 3 months in total	5

Table 2 Oral health status and related behaviour of sample of Thai villagers

Oral health status and related behaviour	Value
1. Sound teeth:	
- number (%) of subjects who had;	
28 sound teeth or more	400 (79.8%)
20-27 sound teeth	93 (18.6%)
less than 20 sound teeth	8 (1.6%)
- mean (sd) sound teeth	29.1 (3.1)
2. Caries experience:	
- mean (sd) of Decayed, Missing and Filled teeth (DMFT)	2.7 (3.1)
- mean (sd) of Decayed teeth	1.04 (1.8)
- mean (sd) of Missing teeth	1.6 (2.1)
- mean (sd) of Filling teeth	0.03 (0.3)
3. Periodontal status:	
-number (%) of sujects who have deep periodontal pockets involved in;	
more than half sextants	18 (3.6%)
less than half sextants	89 (17.8%)
no sextant of mouth	394 (78.6%)
-mean (sd) sextants that had deep periodontal pockets (0 to 6)	0.4 (1.1)
4. Oral cleaniness	
-Mean (sd) plaque score (0 to 3)	0.9 (0.5)
5. Malocclusion status :	
-number (%) of subjects who had ;	
no malocclusion	329 (65.7%)
slight malocclusion	112 (22.4%)
moderate to severe	60 (12.0%)
6. Last dental visit:	
- number (%) of sujects who had last dental visit in;	
less than 1 yr	84 (16.8%)
1-4 yrs	92 (18.4%)
5-9 yrs	16 (3.2%)
10 or more yrs	19 (3.8%)
never visited a dentist	290 (57.9%)

Table 3 The incidence, frequency and severity of oral impacts on various daily performances

Daily performances	% person affected	Mean Frequency score (0-5)	Mean Severity score (0-5)
Physical performances	*n =501*	Of persons affected	Of persons affected
1 Eating	49.7	3.3 (1.4)*	2.9 (1.3)*
2. Cleaning teeth	20.8	2.5 (1.4)	2.6 (1.2)
3. Speaking	4.0	3.1 (1.3)	3.3 (1.6)
4. Physical activities	2.4	1.4 (0.5)	3.7 (1.3)
Psychological performances			
5. Sleeping	11.8	1.4 (0.6)	4.3 (1.0)
6. Smiling	26.1	2.4 (1.1)	2.7 (1.3)
7. Emotional stability	46.5	2.6 (1.3)	3.0 (1.4)
Social performances			
8. Major role activity	9.6	1.3 (0.5)	3.5 (1.4)
9. Contact with people	18.4	2.6 (1.3)	3.4 (1.3)
Total	73.6**	2.7 (1.2)	2.7 (1.2)

* *Standard deviation*

** *overall percentage of persons who had impacts affecting at least one performance (average number of performances affected per person was 1.9, SD=1.8)*

Table 4 Perceived causal symptoms and oral impairments relating to the affected performances

Daily performance	Main Symptoms leading to impacts			Main Oral impairments causing oral impacts		
		n	%		*n*	%
Physical performance						
1 Eating	Pain	146	58.6	Toothache	128	51.4
	Discomfort	90	36.1	Tooth decayed	45	18.1
				Position of teeth	29	11.6
2. Cleaning teeth	Pain	61	58.7	Gum abscess	29	28.6
	Discomfort	40	38.5	Toothache	24	23.3
				Oral ulcer	13	12.6
3. Speaking	Functional limitation	12	60.0	Toothache	6	30.0
				Missing teeth	6	30.0
	Pain	7	35.0	Oral ulcer	4	20.0
4. Physical activities	Pain	12	100.0	Toothache	10	83.3
Psychological performance						
5. Sleeping	Pain	58	98.3	Toothache	53	89.8
6. Smiling	Disatisfaction with appearance	128	97.7	Position of teeth	38	29.0
				Calculus	26	19.8
				Colour of teeth	20	15.3
				Missing teeth	19	14.5
7. Emotional stability	Pain	135	59.2	Toothache	43	48.7
	Discomfort	86	37.7	Gum abscess	27	11.8
				Position of teeth	20	8.8
Social performance						
8. Major role activity	Pain	47	97.9	Toothache	43	89.6
9. Contact with people	Discomfort	61	66.3	Bad breath	60	65.9
				Toothache	6	6.6
	Dissatisfaction with appearance	21	22.8	Missing teeth	5	5.4
Total: person %	Pain	201	40.1	Toothache	164	32.7
	Discomfort	201	40.1	Position of teeth	83	16.6
	Functional limitation	28	5.6	Tooth decayed/hole	67	13.4
				Bad breath	67	13.4
	Dissatisfaction with appearance	132	26.3	Gum abscess	50	10.0
				Calculus	31	6.2

APPENDIX 8

Paper 2 : Oral Impacts on Daily Performances

Proceeding in the conference:
'Assessing oral healthoutcomes-
measuring health status and quality of life',
University of North Carolina, Chapel Hill,
June 13-14, 1996.

Oral Impacts on Daily Performances

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Background

The Oral Impacts on Daily Performances (OIDP) (1) aims to provide an alternative socio-dental indicator which focuses on measuring the serious oral impacts on the person's ability to perform daily activities. The approach should provide advantages, not only in terms of being easier to measure the behavioral impacts on performances than the feeling-state dimensions, but also in being relatively short. In addition to providing the overall oral impacts, OIDP is designed to identify the oral conditions causing the impacts. That facilitates the assessment of treatment needs and the effects of specific clinical conditions on quality of life.

Development of the instrument

Theoretical Framework The theoretical framework of OIDP is presented in Figure 1. It was modified from the WHO International Classification of Impairments, Disabilities and Handicaps (2) amended for dentistry by Locker (3). The main modification was that different levels of consequence variables were established. The first level refers to the oral status, including oral impairments, which most clinical indices attempt to measure. The second level, "the intermediate impacts", includes the possible earliest negative impacts caused by oral health status; pain, discomfort or functional limitation. "Dissatisfaction with appearance" was added in this level since studies indicated that it was a major dimension of oral health outcomes (4-6). In addition, functional limitation may cause pain, discomfort or

dissatisfaction with appearance and vice versa. Any of the dimensions in the second level may impact on performance ability. The third level, or the "ultimate impacts" represents impacts on ability to perform daily activities which consists of physical, psychological and social performances. This level is equivalent to disability and handicap dimensions in the WHO (2) model .

(Figure 1, here)

The index of Oral Impacts of Daily Performances (OIDP) focuses on measuring the Level Three consequences. That makes the measure concise and yet covers the main consequences. Other concise indicators concentrate on some of the intermediate impacts in Level Two such as, measuring pain, or chewing ability. OIDP, on the other hand, encompasses all of the consequences of the Level Two impacts in performing daily activities. Second, it helps to avoid, or at least reduce, overscoring from repeat scoring of the same impacts at each of the three levels. Third, only the significant impacts are recorded, by eliminating minor niggling conditions which do not lead to impacts on daily performances. Lastly, it is less difficult to measure the behavioural impacts, in terms of performance, than the feeling-state dimension. The reliability and validity of behaviourally-based measures are easier to establish (7).

Contents The nine physical, psychological and social performances were developed from the Comparison Table of Disability Indices (8) and from various other socio-medical and socio-dental indicators, and then were pilotting tested to achieve content validity (5, 6, 9-15). After the analysis of internal consistency and item-total score correlation, one of the performance measures, 'Doing light physical activities', was considered to be redundant and excluded, so the final version of OIDP consists of eight daily performances. They are :

a. Eating and enjoying food

b. Speaking and pronouncing clearly

c. Cleaning teeth

d. Sleeping and relaxing

e. Smiling, laughing and showing teeth without embarrassment

f. Maintain usual emotional state without being irritable

g. Carry out major work or social role

h. Enjoying contact with people

The Oral Impacts on Daily Performances system attempts to use the logical approach of impact quantification by using both frequency and severity. A complementary objective is that the severity score weights the relative importance of respondents' perceived impacts within different performances.

Frequency score The criteria used for the estimated description in terms of both frequency and a spell period, was modified from the questionnaire of the National Survey of Health and Development (16) (Table 1). The respondent was asked to describe the frequency of impact by the pattern of occurrence.

(Table 1 here)

The time frame for the OIDP was set at the past 6 months period as that was often been used in chronic pain studies and considered to be appropriate for the commonly by occurring oral conditions.

Severity score The perceived severity of impacts in the OIDP was derived by asking respondents to justify the score, ranging from 0 to 5, as an indication of how much trouble it caused to their daily living. 5 represents "extreme" and 0 represents "none".

Scoring method The score representing the total impact on each performance was calculated by multiplying the frequency with the severity score. The total score was the sum of all the performance scores for an individual. Then the sum was divided by the maximum possible score (8 performances X 5 frequency score X 5 severity score = 200) and multiplying by 100 to give a percentage score.

Causal relationship of impacts To increase the usefulness of the OIDP for

assessing specific treatment needs, questions were asked about the perceived causal symptoms and impairments of any impact on performance. Respondents who perceived any impact were asked whether the major cause of their problems was from pain, discomfort, limitation in function, dissatisfaction with appearance or other problems. Then they were asked to specify the oral impairments, such as toothache, loose tooth, gum abscess or bad breath, which they perceived caused their problems. Descriptive or normal analytical statistics were applied without scoring.

Evaluation of the instrument

The proposed questionnaire was pilot tested and then interview tested on 501 villagers aged 35-44 years in 16 villages in Thailand selected by cluster random sampling (1). 73.6 % of all subjects had at least one daily performance affected by an oral impact during the past 6 months. Mean number of performances affected in the total sample was 1.9 (SD. 1.8) and in affected persons, 2.6 (SD 1.6) (17).

The inter-item Pearson correlation coefficients among the scores of eight performances ranged from 0.03 to 0.54, with a mean of 0.19 and variance of 2.16. The Kappa of test-retest reliability for frequency scoring ranged from 0.95 to 1.0 while Kappa for severity scores ranged from 0.57 to 1.0. Reliability coefficient of item scores ranged from 0.91 to 1.0. The Cronbach alpha of the scale was 0.65. The standard item alpha, in which all items variances were standardized, was 0.67.

To investigate whether the multiplication of frequency score and severity score added more details of impact than using only frequency or severity, the multiple regression model were applied in prediction of two major variables; DMFT and number of sextants with deep periodontal pockets. The results of the three approaches namely; all subsets regression; the stepwise method to select the best predictor among the three kinds of scores; and third, the hierarchical regression, where severity and frequency scores were put into the regression equation, followed by the OIDP score at later stage; showed similar results.

Namely that the OIDP score was a better predictor than either frequency or severity score separately. All subset regression model with OIDP showed the lowest mean square residuals. In the stepwise method, only OIDP was included in the equation to predict both dependent variables. However, the improvement, by multiplying frequency and severity score, was not statistically significant ($p>0.01$). The correlation coefficient between frequency and severity score to OIDP were 0.92 and 0.87 ($p<0.001$). The correlation coefficients between OIDP score and DMFT and deep periodontal pockets (0.31 and 0.23), were similar to frequency (0.28, 0.20) or severity score (0.29, 0.18).

For construct validity test, the OIDP scores of a subgroup with better oral condition, in terms of number of functional teeth, decayed teeth, missing teeth, and sextants with deep periodontal pockets, were much lower than those with poorer oral conditions (1). The percent increase of OIDP scores in groups with 26 or fewer functional teeth, 3 or more decayed, 5 or more missing teeth, and 2 or more sextants of deep periodontal pockets were 175%, 72%, 129% and 97% respectively, compared to the healthier groups. In criterion validity test, subjects were grouped into 3 groups according to their overall perception of trouble from oral problems; those who reported little, fair or very much trouble from oral conditions. OIDP scores for the three groups increased from a mean score of 3.8 in the group with "little trouble" to 10.7 and 18.4 in "fair trouble" and "very much trouble" groups; percentage increases of 184% and 384%, respectively. All the above differences in scores were strongly statistical significant ($p<0.001$).

The final version of the Oral Impacts on Daily Performances is shown in Table 2.

Alternate forms

In comparison to using solely frequency or severity score, OIDP score was a better predictor for DMFT and number of sextants with deep periodontal pockets. Therefore, the multiplication score would still be presented in the final version of OIDP. However, since

the improvement of OIDP compared to either frequency or severity score used alone was not statistically significant in the prediction test, using one of them to improve simplicity and efficiency can be considered. As frequency and severity scores had similar predictive powers, frequency should be a better representative single choice because of its better reproducibity.

Discussion

OIDP was satisfactory as regards construct and criterion validity. The scores discriminated clearly between groups of relatively healthy and those with poor oral status, as well as between people who had different perceptions of overall oral impacts. Longitudinal studies of OIDP are required and should include the sensitivity of change, as well as testing on a wider range of populations with different age ranges, disease prevalences and cultures, and developing into self-administratered version.

OIDP was applied successfully in the integration of perceived impact into normative dental treatment need in a group of Thais (1). By adjusting different cut-off points, OIDP demonstrated the usefulness of indicator in dental treatment need planning in population. OIDP is being used to assess outcomes of treatment in a study in England (18).

The Oral Impacts on Daily Performances measure has acceptable psychometric properties, as well as a sound theoretical basis. A distinguishing feature is that it provides a significant endpoint outcomes scale for oral conditions within a concise, reliable and valid measurement.

References:

(1) Adulyanon S : An integrated socio-dental approach to dental treatment need estimation. [PhD Thesis] London; University of London, 1996.

(2) World Health Organization. International classification of impairments, disabilities, and handicaps: a manual of classification relating to the consequences of disease. Geneva, 1980.

(3) Locker D. Measuring oral health : A conceptual framework. *Community Dent Health* 1988; 5: 3-18.

(4) Linn EI. Social meanings of dental appearance. *J Health & Human Behav* 1966; 7: 289-95.

(5) Cushing AM, Sheiham A, Maizels J. Developing socio-dental indicators - the social impact of dental disease. *Community Dent Health* 1986; 3: 3-17.

(6) Leao ATT, Sheiham A. Relationship between clinical dental status and subjective impacts on daily living. *J Dent Res* 1995; 74(7): 1408-13.

(7) Hall J, Masters G, Tarlo K, Andrews G. Measuring outcomes of health services. Westmead, Department of Community Medicine, Westmead Centre, 1984.

(8) McDowell I, Newell C. Measuring health : a guide to rating scales and questionnaires. Oxford, Oxford University Press, 1987.

(9) Smith JM, Sheiham A. How dental conditions handicap the elderly?. *Community Dent & Oral Epidemiol* 1979; 7: 305-10.

(10) Bergner M, Bobbitt RA. The Sick Role Impact Profile: Development and final revision of a health status measure. *Med Care* 1981; 19: 787-805.

(11) Hunt SM, McEwan J, McKenna SP. Measuring health status.Beckenham, Croom Helm, 1986.

(12) Martin J, Meltzer H, Elliot D. The prevalence of disabilities among adults: OPCS Surveys of disability in Great Britain, Report no. 1, London: HMSO, 1988.

(13) Atchison K, Dolan T. Development of the Geriatric Oral Health Index. 1990; *J Dent Educ* 54:680-7.

(14) Strauss RP, Hunt RJ : Understanding the value of teeth to older adults: influences on the quality of life. *J Am Dent Assoc* 1993; 124: 105-10.

(15) Slade GD, Spencer AJ. Development and evaluation of the Oral Health Impact Profile. *Community Dent Health* 1994; 11: 3-11.

(16) Medical Research Council. National survey of health and development questionnaire. London; Department of Epidemiology and Public Health, University College London, 1989.

(17) Adulyanon S, Sheiham A. Oral impacts affecting daily performances in a low dental dental disease Thai population. *Community Dent Oral Epidemiol* 1996 (In press).

(18) Robinson PG, Nadanovsky P, Sheiham A. Perceived and normative treatment need. The British Society for Dental Research, 44th Annual General Meeting, The University of Bristol, Abstract #216, 1996.

Figure 1 Theoretical model of consequences of oral impacts

(modified from the WHO's International Classification of Impairments, Disabilities and Handicaps)

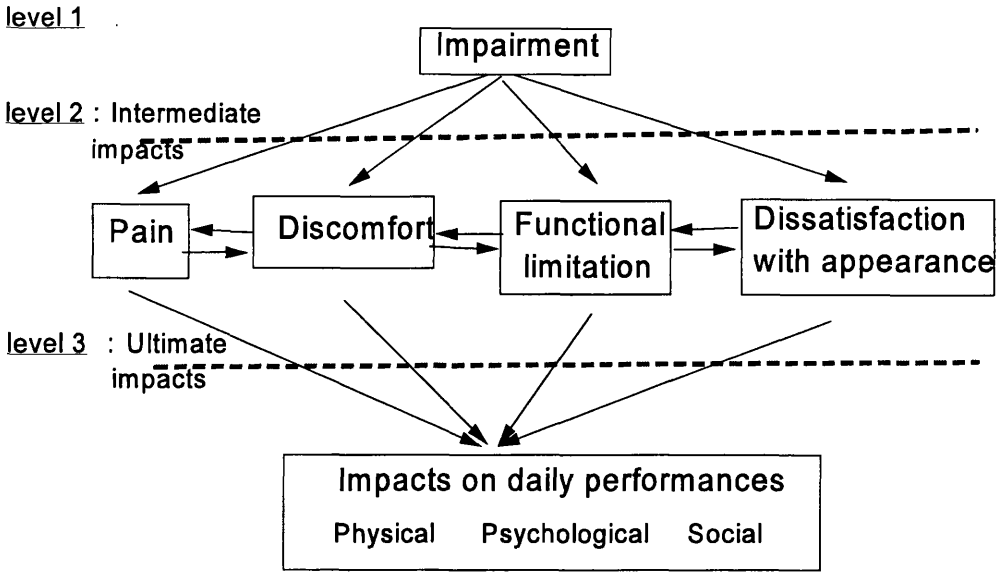

Table 1 Criteria of frequency score of affected performances over past six months

Category	Score
Never affected in past 6 months	0
Less than once a month, or a spell of up to 5 days in total	1
Once or twice a month, or a spell of up to 15 days in total	2
Once or twice a week, or a spell of up to 30 days in total	3
3-4 times a week, or a spell of up to 3 months in total	4
Every or nearly every day, or a spell of over 3 months in total	5

Table 2 The final version of the Oral Impacts on Daily Performances

Questions

1) In the past 6 months, have problems with your mouth, teeth, or dentures caused you any difficulty in ....*(performance)*..?

If yes,
2) a. Have you had this difficulty in ..*(performance)*.. on a regular basis or for a period/spell ?

-If ability restricted on "a regular basis",
b. During the past six months how often have you had this difficulty? *or...*
-If ability restricted "on a period/spell"
c. For how much of the past 6 months have you had this difficulty?

The score of answers of a. and b. are in Table 1

3) And using a scale from 0 to 5, where 0 is no effect and 5 is a very severe effect, which number would you say reflects what the difficulty in ...*(performance)*... had on your daily life?

4)[#] Which problems of your mount, teeth, or dentures are the causes of this difficullty?

Performances

a. Eating and enjoying food
b. Speaking and pronouncing clearly
c. Cleaning teeth
d. Sleeping and relaxing
e. Smiling, laughing and showing teeth without embarrassment
f. Maintain usual emotional state without being irritable
g. Carrying out major work or social role
h. Enjoying contact with people

Scoring method

OIDP score = [(frequency score*of oral impact on "Eating" X severity score*of impact on "Eating")+
(frequency of "Speaking" X severity of "Speaking") +
(frequency of "Cleaning teeth" X severity of "Cleaning teeth") +
(frequency of "Sleeping" X severity of "Sleeping") +
(frequency of "Smiling" X severity of "Smiling") +
(frequency of "Emotional stability" X severity of "Emotional stability") +
(frequency of "Major role" X severity of "Major role") +
(frequency of "Contact with people" X severity of "Contact with people")] X 100/ 200***

[#] *Additional question to identify condition specific impacts*
* *score ranged from 0 to 5*
** *maximum possible score [Sum of 8 performances score{ 5 frequency score x 5 severity score} = 200]*

APPENDIX 9

Abstract : A new socio-dental indicator of Oral Impacts on Daily Performances

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A new socio-dental indicator of Oral Impacts on Daily Performances.

1711 S. Adulyanon* and A. Sheiham (Department of Epidemiology and Public Health, University College London, UK).

Existing composite socio-dental indicators which measure the outcomes of oral conditions, are too long for large population surveys. In addition, they overscore by repeat measuring some of the impacts. To develop a concise indicator of Oral Impacts on Daily Performances (OIDP), nine physical, psychological and social aspects of daily activities representing major variables from various social indicators were chosen for their content validity. Scores were calculated by multiplying the numeric frequency by the severity scores of each performance. Then scores for all performances were summated. 501 people aged 35-44 yrs in Khon Kaen, Thailand, were interviewed and clinically examined. 73.6% of all subjects had at least one daily performance affected by an oral impact. The OIDP score was tested for reliability and validity. The Cronbach alpha of internal consistency was 0.67; the kappa of test-retest reliability ranged from 0.6 to 1.0 ; the criterion validity was shown by a strong relationship with general perceptions of oral impacts ($p<0.001$). Construct validity was demonstrated by significant differences of scores between groups of subjects with high and low prevalence of deep periodontal pockets and decayed and missing teeth ($p<0.001$). We conclude that the OIDP is a valid and reliable alternative indicator of oral outcomes which is appropriate particularly in large population.

1705 The provision of restorative care for children in the North West of England

R C CRAVEN* and A S BLINKHORN (Department of Dental Medicine and Surgery, University of Manchester, UK)

Surveys of children aged 12 and 14 are held at 4 yearly intervals throughout the UK. This study examines data from representative samples of children aged 12 (n = 46,930) and aged 14 (n = 7,175) who were resident in the North West Region. The aim of the study was to calculate the Care Index (ratio of filled teeth to DMFT), to identify secular trends and to generate hypotheses to explain them. In each case, the Care Index for the North Western Region was the worst of any English region, namely 47% for 12 year olds (at 1993) and 56% for 14 year olds (at 1991). In each case, the trend was for the Care Index to decline over the previous 4 years. Changes in the National Health Service contract for general dentists have been suggested as the cause despite the fact that the trend in Care Index predates the contract change. A reduced availability of general anaesthetic extraction service is suggested, yet the mean number of missing teeth has not declined. A lack of availability of dental services is suggested, yet the North West Region has the highest rates of enrolment for children in the NHS capitation system. A possible explanation lies in the trend for longer recall periods under the new capitation system and the difficulty of differentiating between the preventive and therapeutic use of sealants. Data from regular surveys in England show a decline in the proportion of decay experience which is treated restoratively. It is unclear to what extent this represents undertreatment or the misdiagnosis between therapeutic and preventive application of sealants.

1706 Access to Inpatient Oral Surgery Services - A Socio-economic Issue? M.S. GILTHORPE* and R. BEDI (University of Birmingham, United Kingdom).

The aim of the study was to examine the socio-economic status of people who use secondary dental care services between 1991 and 1994. Hospital inpatient activity data of the UK's largest Regional Health Authority (West Midlands) was combined with geo-demographic details of the 1991 National Census. Across the three year study period, the data comprised 34 specialties and some 3,092,196 hospital inpatient episodes, of which 38,319 (1.24%) were classified as dental. Surgical removal of teeth accounted for 21,675 episodes (56.6% of all dental activity), and 15,730 (41.1%) were extractions of third molars. This level of activity remained relatively static over the three year period. Gender differences were observed, with surgical removal of impacted teeth occurring twice as frequently amongst females than amongst males. This difference was not observed for any other dental procedure. Surgical extractions occurred predominantly for the 15-34 year-old age range, and age-gender standardised activity ratios were compared for several bands of socio-economic status. In contrast to all other dental procedures, the rates for surgical extraction of teeth was least in the 20% of the population experiencing the lowest levels of material wealth, with activity levels down by around 50%. This was in marked contrast to all other socio-economic groups. In conclusion, hospital inpatient oral surgery services were utilised to a similar level by all socio-economic groups, with the exception of 50% utilisation rates amongst the 20% of the population who experienced the lowest levels of material wealth.

1707 Do Spouses Share Dental Neglect ? : Community Study of Older Adults. R. STRAUSS (UNC-CH)*, J. WEINTRAUB (UCSF), S. GANSKY (UNC-CH) and P. EDWARDS (UNC-CH, N.C., USA).

Self- and examiner-rated dental neglect was studied in 58 dentate spousal pairs from 366 community dwelling subjects (65 years and older) and their 92 marital spouses. Self-rated dental neglect was ≥3 of 9 positive interview items. Examiner-rated dental neglect was ≥ 1 of 3 positive ratings. Of subjects and spouses (n=116), 29%(34) had clear dental neglect(+self;+exam); 11%(13) were "in denial" (-self;+exam), 19%(22) were "worried well"(+self;-exam), and 40%(47) had no dental neglect(-self;-exam). Of 18 subjects with clear dental neglect, 72%(13) had spouses also with clear neglect. Of 24 subjects without dental neglect, 62%(15) had spouses with no neglect. For the 4 neglect categories, the weighted Kappa was .66 (p<.001) with a 95% C.I.[.48,.84], indicating substantial agreement between subjects and spouses. Through pairwise odds ratios, a person with clear dental neglect was 32 times more likely than others to have a partner with clear neglect; a person without dental neglect was 5.4 times more likely to have a like partner. Persons "in denial" were 1.5 times more likely to have partners like themselves; the "worried well" were 3.6 times more likely. Even though dental neglect has a disease component, social and environmental processes, above and beyond genetic processes, shape dental neglect within families: either people select spouses with some similar dental behaviors or spouses over time develop similar dental characteristics.

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1708 Recent Dental Exams Among Adults in Washington State - Behavioral Risk Factor Surveillance System, 1993-1994. J. CLEVELAND*[1], K. HOLM[2], D. MALVITZ[1], B. HINES[1]. ([1]CDC, Atlanta GA; [2]Washington State Department of Health, Olympia WA.)

Objective: To provide state-level estimates of the prevalence of recent dental exams among Washington adults. Methods: Data were available for 5,937 Washington state adults aged ≥18 years who participated in the 1993 or 1994 Behavioral Risk Factor Surveillance System (BRFSS), a state-based, random-digit-dialed telephone survey that collects self-reported data from a representative sample of civilian, noninsitutionalized persons aged ≥18 years. To provide baseline oral health information, four questions, including one on time since the last dental exam, were added to the WA BRFSS in 1993 and 1994. Associations between a dental exam within the past 12 months (recent dental exam=RDE) and selected variables, including age, sex, education, household income, and subjective health status were examined using SUDAAN software. Nearly identical estimates were found for both years, thus, the data were combined. Results: About 70% of respondents reported a RDE. This estimate was consistent for females and males (71% vs 68%) and for all age groups except those ≥65 years (59%). RDEs were more frequent among respondents with some vs no college (62% vs 32%). RDEs also were directly associated with higher household incomes and subjective health status, e.g., 82% of respondents reporting both annual incomes ≥$35,000 and excellent/very good health had RDEs as compared to only 45% of respondents with <$15,000 and fair/poor health. Conclusion: While the majority (70%) WA adults reported a RDE, we identified specific populations with lower prevalence of RDEs, specifically, adults aged ≥65 and those with lower household incomes, education, and subjective general health status. BRFSS data on oral health can be a valuable tool for needs assessment and program evaluation at the state level.

1709 Factors Influencing Perceived Need for Dental Care Among Military Personnel. M.C.CHISICK*, P.POINDEXTER, and A.YORK (Army Dent. Res. Det. and Naval Dent. Res. Inst., MD, USA).

This study explores factors that influence perceived need for dental care among active duty U.S. military personnel. The data come from a prestratified random sample of 13,050 (85% response rate) Army, Navy, Air Force, and Marine Corps personnel collected between February 1994 and January 1995. In addition to receiving a comprehensive dental examination by a calibrated dentist, respondents answered demographic and perceived need queries on self-administered questionnaires. Bivariate (weighted data) and logistic regression (unweighted data) analyses were used to examine the association between demographic and clinical measures and perceived need for dental care. All analyses were performed using Stata statistical software and SUDAAN. Bivariate results show that about half of all U.S. military personnel perceive a need for dental care with statistically significant differences across race, rank, age, education, and branch of service. Logistic regression results show that the likelihood of perceived need for dental care increases with calculus, extensive decay, dental fitness class, and increasing age group compared to 18-19 year olds; the likelihood decreases for other races compared to whites, for all rank groups compared to junior enlisted personnel, and for other military branches compared to the Army. These results suggest that oral health status as well as demographic factors contribute to shaping perceived need for dental care in U.S. military personnel.

1710 Socio-Behavioral Determinants of Non-Functional Oral Health Status in Native American Elders. P.L. DAVIDSON*, T.E. RAMS, N. REIFEL, T. NAKAZONO and R.M. ANDERSEN (UCLA Dept. of Health Services, Medical College of Pennsylvania-Hahnemann University School of Medicine, and Indian Health Service)

Edentulous individuals without dentures suffer from a relatively non-functional oral health status. Socio-behavioral determinants underlying a non-functional oral health status were examined in a population-based sample of 177 Navajo (63 male and 114 female) and 191 Lakota (75 male and 116 female) edentulous Native American adults, aged 65-74 years, participating in the multi-national WHO ICS-II study. Each subject was clinically evaluated, and completed a standardized interview process assessing various predisposing sociodemographics, oral health beliefs, enabling resources, and oral symptoms and behaviors. Subjects without dentures were classified as having a non-functional oral health status. 46 (26%) Navajo (27 male and 19 female) and 47 (24.6%) Lakota (21 male and 26 female) were edentulous without dentures. Sudaan multivariate analysis showed no significant differences in ethnicity, gender, education, social support, fear of oral pain, and most oral health beliefs between edentulous persons with and without dentures. However, edentulous Native American elders reporting no usual source of dental care, lower household income, a current cigarette smoking habit, more oral symptoms, lower self-perceptions of their general health, and less belief in benefits of preventive behaviors were significantly more likely not to have dentures. These findings suggest that oral health policy-making and planning for edentulous Native American elders exhibiting a non-functional oral health status should emphasize multi-disciplinary interventions aimed at altering overall personal lifestyle attitudes and behaviors, rather than programs directed merely at oral health system resources or reducing fear of dental care. Supported by AHCPR.

1711 A new socio-dental indicator of Oral Impacts on Daily Performances.

S. Adulyanon* and A. Sheiham (Department of Epidemiology and Public Health, University College London, UK).

Existing composite socio-dental indicators for measuring outcomes of oral conditions require questionnaires that are too long for large population surveys. In addition, they overscore by measuring some of the impacts more than once. To develop a concise indicator of Oral Impacts on Daily Performances (OIDP), nine physical, psychological and social aspects of daily activities, representing major variables from various socio-dental indicators, were chosen for their content validity. Scores were calculated by multiplying the numeric frequency by the severity scores of each performance. Then scores for all performances were summated. 501 people aged 35-44 yrs in Khon Kaen, Thailand, were interviewed and clinically examined. 73.6% of all subjects had at least one daily performance affected by an oral impact. The OIDP score was tested for reliability and validity. The Cronbach alpha of internal consistency was 0.67. The kappa of test-retest reliability ranged from 0.6 to 1.0. The criterion validity was shown by a strong relationship with general perceptions of oral impacts (p<0.001). Construct validity was demonstrated by significant differences of scores between groups of subjects with high and low prevalence of deep periodontal pockets and decayed and missing teeth (p<0.001). We conclude that the OIDP is a valid, reliable indicator of oral outcomes and is appropriate for large population surveys.

1712 *Acculturation of Mexican-American Hispanics and Oral Health Outcomes*

JP, BROWN,* SI, HENSON, H, HAZUDA , & MK, BAEZ, J, STEFFENSEN, Depts. Community Dentistry & Medicine, Univ. of Texas Hlth. Sci. Ctr. San Antonio.

Acculturation, the acquiring of behaviors, attitudes and values of the adopted society, has been shown to relate to outcomes of heart disease and NIDDM in Mexican-Americans (Mx-Am) (Hazuda & Stern 1988). H HANES analysis (Ismail and Szpunar 1990) has shown significant relationships of acculturation of Mx-Am to prevalence of gingivitis and periodontal pocketing (PI), but not to caries (DMF), after controlling for SES. The Cuellar (1980) 8 item acculturation scale used in HANES, has been criticized as containing immutable items and as a single global measure of a multi-dimentional process.

A complex sample of San Antonio adults aged 35-44 and 65-74 was dentally examined and interviewed in depth, including the full 33 item validated acculturation and social integration scales of Hazuda (1988). Five dimensions of acculturation were measured in these Hispanics (>90% Mx-Am): A1-childhood experiences with English vs Spanish, S1- interaction with mainstream society as a child; F1 functional integration with mainstream society, A4- value placed on Mexican cultural origin, and A5- attitude to traditional family structure and sex-role organization.

Overall, including the edentate, there were significant differences in acculturation by age, education, income but not gender. For dentate subjects, DFT and percent caries treatment complete were significantly greater (p<0.05) overall with higher acculturation and greater functional integration. These cultural descriptors were not significantly associated with Periodontal Pocketing ≥ 4mm., or LOA ≥ 4mm overall (based on CPITN index teeth); nor for edentulousness. Dental attendance was significantly (p<0.05) associated in older adults with F1, A4 & A5.

Percent caries treatment complete, LOA≥ 4mm, Pocketing ≥ 4mm were modeled as oral health outcomes, controlling for age, education, income and gender. None of the five dimensions of acculturation and social integration improved the model, and so were not found to be important determinants of these three measures of oral health in Mexican Americans.

(Supported by WHO-OH unit, CDC 200-89-0743, NIDR DE 10589)